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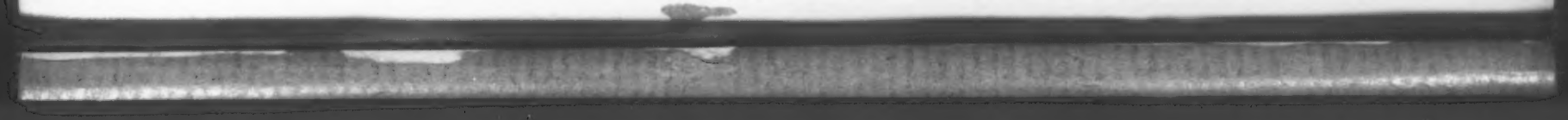


MUNICIPAL ENGINEERING

VOLUME XXXIV. FEBRUARY, NINETEEN HUNDRED EIGHT. NUMBER TWO

PROPOSED BUILDING ORDINANCE GOVERNING REINFORCED CONCRETE.*

At the last annual meeting of the Association, this committee submitted a proposed ordinance governing cement construction for buildings. This ordinance was referred to the specification committee.

There is probably no way in which the use of a cement as a building material can be better advanced than by adequate laws. The results obtained in cement construction, where the work was intelligently designed and installed, have been excellent. This good record, however, is marred to no small degree by the failures which occur from time to time. These failures, upon investigation, invariably show the fault not to be due to the cement, but to a lack of knowledge as to its use, or attempt to cheapen the work. There is no other material used in the construction of buildings that requires competent supervision more than cement and its use should not be attempted by unskilled or incompetent persons.

The National Board of Fire Underwriters, during the past year, has submited an ordinance covering the construction of buildings of concrete. This ordinance will be adopted in some cities and used as a basis for ordinances in other cities. This ordinance is submitted with the recommendation that it be referred to the specification committee for further report to the Association.

The term "reinforced concrete" or "concrete-steel" in this section shall be understood to mean an approved concrete mixture reinforced by steel of any shape, so combined that the steel will take up the tensional stresses and assist in the resistance to shear.

Reinforced concrete construction may be accepted for fireproof buildings, if designed as hereinafter prescribed; provided, that the aggregate for such concrete shall be hard-burned broken bricks, or terra cotta, clean furnace clinkers, entirely free of combustible matter, clean broken stone, or furnace slag, or clean gravel, together with clean silicious sand, if sand is required to produce a close and dense mixture; and provided, further, that the minimum thickness of concrete surrounding and reinforcing members one-quarter inch or less in diameter shall be one inch; and for members heavier than one-quarter inch the minimum thickness of protecting concrete shall be four diameters, taking that diameter, in the event of bars of other than circular cross-section, which lies in the direction in which the thickness of the concrete is measured; but no protecting concrete need be more than four inches thick for bars of any size; and provided, further, that all columns and girders of reinforced concrete shall have at least one inch of material on all exposed surfaces over and above that required for structural purposes; and all beams and floor slabs shall have at least three-quarters inch of such surplus material for fire-resisting purposes; but this shall not be construed as increasing the total thickness of protecting concrete as herein specified.

All the requirements herein specified for protection of steel and for fire-resisting purposes shall apply to reinforced concrete filling between rolled-steel beams, as well as to reinforced concrete beams and to entire structures in reinforced concrete. Any concrete structure or the floor filling in same reinforced or otherwise, which may be erected on a permanent centering of sheet metal, or metal lathing and curved bars or a metal centering of any other form, must be strong enough to carry its loads without assistance from the centering, unless the concrete is so applied as to protect the centering as herein specified for metal reinforcement.

Exposed metal centering or exposed metal of any kind will not be considered a factor in the strength of any part of any concrete structure, and a plaster finish, applied over the metal shall not be deemed sufficient protection. All concrete for reinforced construction whenever used in such buildings must be mixed in a machine which mixes one complete batch at a time, and entirely discharges it before

*A report to the National Association of Cement Users by the Committee on Fire Protection.

another is introduced. At least twenty-five complete revolutions must be made at such a rate as to turn the concrete over at least once in each revolution for each batch.

Before permision to erect any concrete-steel structure is issued, complete drawings and specifications shall be filed with the Commissioner of Buildings, showing all details of the construction, the size and position of all reinforcing rods, stirrups, etc., and giving the composition of the concrete.

The execution of work shall be performed by workmen under the direct supervision of a competent foreman or superintendent.

All forms and centering for concrete shall be built plumb and in a substantial manner with inside surface smooth and made tight so that no part of the concrete mixture shall leak out through joints, cracks or holes, and after completion shall be thoroughly cleaned out, removing shavings, chips, pieces of wood and other material, which should not be permitted in forms.

The reinforcing steel shall be accurately located in the forms and secured against displacement while the concrete is being placed and tamped.

Concrete shall be placed in forms as soon as practicable after mixing, and in all cases immediately after the addition of water.

Whenever fresh concrete joins concrete that is set, or partially set, the surface of the old concrete shall be roughened, cleaned and thoroughly slushed with a grout of neat cement and water.

Concrete shall not be installed in freezing weather; such weather shall be taken to mean a temperature of thirty-two degrees Fahrenheit or lower; concrete shall not be allowed to freeze after being put in place, and, if frozen, shall be removed.

The time at which forms and centering may safely be removed will vary from twenty-four hours to sixty days, depending upon temperature and other atmospheric conditions of the weather; the time for such removal to be determined by the commissioner of buildings.

The concrete shall be mixed in the proportions of one of cement, two of sand and four of other aggregate as before provided; or the proportions may be such that the resistance of the concrete to crushing shall not be less than 2,000 pounds per square inch after hardening for twenty-eight days, but for reinforced or plain concrete columns the mixture shall not be leaner than one part of cement, two of sand and five of the coarser aggregate in any case. The tests to determine this value must be made under the direction of the commissioner of buildings. The concrete used in concrete-steel construction must be what is usually known as a "wet" mixture.

Only high-grade Portland cements shall be permitted in reinforced concrete or concrete-steel constructed buildings. Such cements, when tested neat, shall, after one day in air, develop a tensile strength of at least 300 pounds per square inch; and after one day in air and six days in water shall develop a tensile strength of at least 500 pounds per square inch; and after one day in air and twenty-seven days in water shall develop a tensile strength of at least 600 pounds per square inch. Other tests, as to fineness, constancy or volume, etc., made in accordance with the standard method prescribed by the American Society of Civil Engineers, may, from time to time, be prescribed by the Commissioner of Buildings.

The sand to be used must be clean, sharp grit sand, free from loam or dirt, and shall not be finer than the standard sample kept in the Department of Buildings.

The stone used in the concrete shall be clean, broken stone, of a size that will pass through a three-quarter inch ring, or good gravel may be used in the same proportion as broken stone, or broken hard bricks, or terra cotta, or furnace slag, or hard clean clinkers may be used.

The steel shall meet the requirements of Section 21 of this Code, which is as follows:

"Steel. All structural steel shall have an ultimate tensile strength of from 54,000 to 64,000 pounds per square inch. Its elastic limit shall be not less than 32,000 pounds per square inch and test specimens, ruptured in tension, must show a minimum elongation of not less than 20 percent. in eight inches. Rivet steel shall have an ultimate strength of from 50,000 to 58,000 pounds per square inch."

Concrete-steel shall be designed in accordance with the following assumptions and requirements:

(1) The adhesion between the concrete and the steel is sufficient to make the two materials act together; the unit value of the adhesion is at least equal to the unit shearing strength of concrete.

(2) The design shall be based on the assumption of a load four times as great as the total working load (ordinary dead load plus ordinary live loads) producing a stress in the steel equal to the elastic limit, and a stress in the concrete equal to two thousand pounds per square inch.

(3) The modulus of elasticity of concrete at two thousand pounds per square inch is equal to one eighteenth of the modulus of elasticity of steel.

(4) The steel takes all the tensile stress.

(5) The stress-strain curve of concrete in compression, when the stress in the extreme fibre is two thousand pounds per square inch, may be assumed.

(a) As a straight line.

(b) As a parabola with its axis vertical and its vertex on the neutral axis of the beam, girder or slab, or

(c) As an empirical curve with an area one-quarter greater than if it were a straight line, and with its center of gravity at the same height as that of the parabolic area assumed in (b).

(6) The assumption belonging to the common theory of flexure, where not modified by any of the foregoing, will apply.

In the design of structures involving reinforced concrete girders and beams, as well as slabs, the girders and beams shall be treated as T-beams, with a portion of the slab acting as flange, in each case. The portion of the slab so acting shall be determined by assuming that in any horizontal-plane

section of the flange, the stresses are distributed as the ordinates of a parabola, with its vertex in the stress-strain curve and with its axis in a longitudinal vertical plane through the center of the rib of the T.

The shearing strength of concrete, corresponding to a compressive strength of two thousand pounds per square inch, shall be assumed at two hundred pounds per square inch.

All reinforced concrete T-beams must be reinforced against the shearing stress along the plane of junction of the rib and the flange. Where reinforced concrete girders carry reinforced concrete beams, the portion of the floor slab acting as flange to the girder must be reinforced with bars near the top at right angles to the girder, to enable it to transmit local loads directly to the girder and not through the beams, thus avoiding an integration of compressive stresses due to simultaneous action as floor slab and girder flange.

Concrete in direct compression shall not be stressed, under the working load, more than three hundred and fifty pounds per square inch. Reinforced compression members shall be designed on the assumption that this stress in the concrete will be simultaneous with one of six thousand pounds per square inch in the steel. Should the use of hooped concrete be proposed, the working stresses will be a subject for special consideration by the Commissioner of Buildings.

In the execution of work in the field, work must be so carried on that the ribs of all girders and beams shall be monolithic with the floor slab.

In all reinforced concrete structures, special care must be taken with the design of joints to provide against local stresses and secondary stresses due to the continuity of the structure.

In the determination of the bending moments due to the external forces, beams and girders shall be considered as simply supported at the ends, no allowance being made for continuous construction over supports. Floor plates, when constructed continuous and when provided with reinforcement at top of plate over the supports, may be treated as continuous beams, the bending moment for uniformly distributed loads being taken at not less than 0.1 Wl; the bending moment may be taken at 0.05 Wl in the case of square floor plates which are reinforced in both directions and supported on all sides.

When the shearing stresses developed in any part of a reinforced concrete or concrete-steel constructed building exceed under the multiplied loads the shearing strength as fixed in this Section, a sufficient amount of steel shall be introduced in such a position that the deficiency in the resistance to shear is overcome.

When the safe limit of adhesion between the concrete and steel is exceeded, provision must be made for transmitting the strength of the steel to the concrete.

Concrete-steel may be used for columns in which the ratio of length to least side or diameter does not exceed twelve. The reinforcing rods must be tied together at intervals of not more than the least side or diameter of the column.

The contractor must be prepared to make load tests on any portion of a reinforced concrete or concrete-steel constructed building within a reasonable time after erection as often as may be required by the Commissioner of Buildings. The tests must show that the construction will sustain a load with a factor of safety for floors and structural members as required by Section 136 of this Code, which is as follows:

"Where the unit of stress for any material is not prescribed in this Code the relation of allowable unit stress to ultimate strength shall be—

"As one to four for metals, subjected to tension or transverse stress.

"As one to six for timber.

"And as one to ten for natural or artificial stones and brick or stone masonry.

"But wherever working stresses are prescribed in this Code, varying the factors of safety herein above given, the said working stresses shall be used."

FINANCIAL SUCCESS IN A BLOCK FACTORY.*

By Willis Pierson, East Orange, N. J.

Much has been written on the manufacture of cement building block, but I cannot recall ever having seen an article which would assist one in making a financial success of his plant beyond giving him assistance in the mechanical construction of his block, and as I take it you are not conducting your block business as a pastime just enough suggestions to provoke a general discussion might not be out of place.

To begin with systematize your business from top to bottom; see to it that every man has a definite work to do, and is held accountable for the way in which that work is done, eliminate the "everybody's business, nobody's business" idea; require your superintendent to make daily reports to you of the amount of material used, wages paid, and block made, which data, together with your general expense and depreciation items will give you the basis for an accurate cost record; without which you cannot intelligently conduct business. My experience has

*A paper read before the National Association of Cement Users.

taught me proper depreciation to charge off is about ten per cent. for buildings, thirty per cent. for block machines, twenty per cent. for machinery, and fifteen per cent. for block cars.

After systematizing your business do not forget that a good ship does not necessarily guarantee a safe port; nor does a good system alone insure a successful business. A water-logged scow in the hands of a master pilot may fare better in the storm than a twin-screw ocean-liner, manned by incompetents. You can't set the helm of your business barge in one fixed direction and expect it to guide you into the harbor of success. The shoals and rocks of unexpected conditions rise up in every mile of the sea. Only the skillful piloting that meets each danger as it arises can steer you safely through.

It's the man behind the wheel that brings the ship into the haven of profit. It's not the system alone, but intelligent direction of it, that produces results.

Systematize your aims and plans—but plan and aim your system.

It is a most regretable fact that the history of the manufacture of cement building blocks has resulted in a financial loss to at least seventy-five per cent. of those who have engaged in it, and I am confident that this is due not to a lack of quality of product, but to either an ignorance of, or indifference to, good business methods.

When you place a superintendent in the charge of your plant don't butt in and run it yourself, thereby depriving him of all initiative, but leave him alone and give him a chance to make good; if he doesn't, get a new superintendent.

Systematizing a manufacturing business reveals the necessity of creating two distinct departments, no matter how small or how large the plant may be; the department for the production of block, and the department for creating a demand for those block, or in other words production and selling. Put your superintendent in charge of the first, and you assume management of the second. Material for making factory superintendents is both cheap and plentiful, but the man who gets the orders is the fellow who really keeps the smoke coming out of the factory chimney; he is the engine that pulls the whole train, This work calls for concentrated energy, and it is just to this point that most of the failures may be traced. Instead of directing all our energies to the creation of business, we attempt to be superintendent in the morning, and a salesman in the afternoon, or half and half all the time. It can't be done, for, much done, little accomplished, is both true and trite. If this condition exists in your business pick out a superintendent as soon as you get home, and leave the routine work to him, for your place is on the bridge, and not down in the engine room, in the office and not in the factory. Someone has truly said that while opportunity knocks at least once at every man's door, the party inside has no right to expect the panels to be kicked in. And it may be added that if the expectant party is a block maker he had best not wait inside at all. The only way in which we can ever hope to catch a glimpse of opportunity is to get outside the door, and do a lot of active searching for her up and down the street.

I wish to disclaim any intention of posing as a business doctor, but these are some points which I have learned by experience.

CARE OF SHADE TREES.

In a paper on "Municipal Control of Planting and Care of Shade Trees" presented before the American Society of Municipal Improvement, which will me found in MUNICIPAL ENGINEERING, vol. xxxi, p. 377, Mr. William Solotaroff, the secretary and superintendent of the Shade Tree Commission of East Orange, N. J., showed the effects of lack of supervision and control of the treatment of shade trees and gave some idea of the methods of overcoming these troubles which the newly constituted Shade Tree Commission of his city was proposing to apply.

Since the date of that paper the commission has had more than a year of experience and it is now able to show some results and give some indications of what the future effects of their work will be. From the latest reports of the commission the follow-

I. UNIFORM PRUNING OF TREES, WILLIAM STREET, EAST ORANGE, N. J.

II. DECAYED CAVITY IN TREE.

ing information about methods and results is gathered.

Preliminary to the planting of trees on any street, all existing ones are recorded. Their kind, size, condition and distance apart are entered in a field book. The trees are carefully mapped on block maps to a scale of fifty feet to the inch. By consulting the maps, the trees to be removed can be ascertained and the number of trees necessary to plant can be calculated. When trees are set out, their position is entered with red ink on the same maps and the kind of species selected for the street is indicated. The streets selected for mapping are not only those where planting is contemplated, but all streets are taken up as time permits with the end in view of making a complete record of all the trees in the city.

The jurisdiction of the Shade Tree Commission does not extend beyond the fence line on any street. Numerous inquiries, however, are made at the office as to the manner of treatment of diseased fruit trees and shrubs. Advice was freely given any citizen applying for the same, regarding trees on his own property.

In the trimming of all trees, great care is taken to cut off all limbs close to and even with the trunk. All scars are painted with a coat of thick coal tar. All trees on a street are pruned to a uniform height, and as far as possible that height is made ten feet to clear all street lights. One of the accompanying illustrations shows the result of the uniform pruning of the red maple trees on William street near Grove.

The campaign against the insects infesting shade trees forms one of the chief tasks of the commission. The control of the injurious insects not only preserves the foliage of the trees for the season, but maintains their health and vitality. What can be done by persistent work in this line is shown by the results with the wooly maple scale (Pseudococcus Aceris), which atacks the sugar maple. Other pests are the tussock moths, attacking the American elm and linden, the white maple and the horse-chestnut, the cottory maple scale, attacking the white maple, the elm-leaf beetle, the spring elm caterpillar, the bag worm and the fall web worm.

By far the most important and effective work of the Shade Tree Commission was the successful extermination of these pests that threatened to injure the trees. Few realize what has actually been done to preserve the health of the trees, to prevent defoliation by caterpillars and sucking insects, and to maintain the condition of the foliage as long as possible into the fall season. The idea constantly borne in mind is to destroy the insects in as early a stage as possible, to minimize both the amount of work required in treatment and the injury done to the trees.

III. DECAYED CAVITY IN TREE, CLEANED READY FOR FILLING.

The preservation of existing old trees is as important as setting out new ones. The lack of care of the trees in the city in the matter of placing guards around them, to protect them from horse bites and other injury has caused considerable damage to many trees, and failure to repair properly such injuries at the time of occurrence has caused the wood to decay and mutilations of the trunks to increase. Also the leaving of short stumps by improper pruning has prevented the healing of the wounds so made and decay has been carried in many cases to the hearts of the trees. The Shade Tree Commission repairs the old existing trees on the public streets. Cavities in trees have been carefully cleaned of decayed wood and filled with cement and all abrasions of the bark have been painted with coal tar to prevent the drying out and decay of the exposed wood.

The three small cuts accompanying show the stages in the process of tree repair. One shows the cavity in the tree, another the cavity after it has been thoroughly scraped and all decayed wood removed and the last the tree after the cavity has been filled with cement.

The presence of the sugar maple borer as a tree pest in this vicinity several years ago caused considerable injury to the sugar maples. The caterpillar of the borer confines its operations to the inner bark and sapwood of the main limbs, running a burrow half around a tree or girdling it completely sometimes. The injury to the trees is not immediately apparent, but in time limbs here and there die out and finally the entire tree is killed. Most of the dead trees removed have been sugar maples, killed by borers. According to the law under which the Shade Tree Commission is organized, the proceeds of the tax ordinance, 1-10 of a mill on the dollar of the taxable valuation, can be applied only for setting out and caring for new trees. Additional appropriations granted to the Commission enable the carrying on of the other work such as spraying pruning, repairing of old trees and removing those dead.

The resources of the commission are the proceeds of the tax of 0.1 mill on the property valuation, which amounts to about $2,000 a year; special appropriations by the city council for pruning, spraying, removal of read trees, etc., perhaps $500 a year; and assessments against the property

V. DECAYED CAVITY IN TREE, FILLED WITH CEMENT.

benefited to pay for setting out trees, which average about $1500 a year; the total being about $4,000 a year.

Notwithstanding the smallness of its appropriations and other funds the commission has done a large amount of work. During the first three years of the commission over thirty streets, aggregating five miles in length, have been improved by uniform planting. The varieties of trees which have been used are oriental planes on two streets, pin oaks on two streets, Norway maples on ten streets, sugar maples on eleven streets, European lindens on three streets, and American lindens on three streets. During the three years the trees on 31.2 miles of city streets have been pruned. Fifty-eight dead trees ranging from 10 to 42 inches diameter were removed.

MUNICIPAL ENGINEERING is indebted to William Solotaroff, the engineer and superintendent of the commission and to the commission's reports for the above information and the accompanying illustrations.

The acceptance of the law by New Jersey cities is optional, but the results in East Orange promise so well that Passaic, Newark, South Orange, Rutherford, Plainfield, Morristown, and Camden have established tree commissions. The idea seems to be pleasing to other states also for the last Pennsylvania legislature passed a law exactly like the New Jersey law.

METHODS AND COSTS OF CONCRETE CONSTRUCTION WITH SEPARATELY MOLDED MEMBERS.*

By W. H. Mason, Stewartsville, N. J.

This method of constructing mill buildings by casting the members separately and erecting them after they have become sufficiently hard to handle, has been followed by the Edison Portland Cement Company for something over a year; during this time we have built kiln buildings and one slinker storage building. This paper is an attempt to describe a cement storage building, all of the members for which are made and now it only remains to finish the erection, and a part of the side walls, and for which we can give better details and costs.

The building is designed to hold 350,000 barrels of cement; the overall dimensions are 144 feet by 360 feet by 30 feet high. On account of the enormous pressure of cement when stored in bulk, the side walls were made in place by the usual method, and are 7 feet thick at the ground line. One end of the building contains 12 bins, the walls of which were also made in place. The columns, girders, and roof slabs were cast about half a mile away and brought to the building on railroad cars for erection. The roof, which has an area of over 50,000 square feet, is made of concrete slabs 12 feet by 6 feet by 4 inches thick. These are supported by concrete girders which in turn are carried by the columns. There is also an additional row of girders and columns on one side of the building for the purpose of carrying the conveyors, etc., which deliver cement into the building.

For the completed building, there is a total of 141 columns, 187 girders, and 720 roof slabs.

In preparing to cast the members, we set up a ½-yard concrete mixer at a place convenient for getting stone, and then ran a spur track to it which was connected to the main line of railroad by a switch. On each side of the spur track, which was on practically level ground, we leveled off beds and put 4 inches of cinder on them; then the cinder was wet down and rammed, and concrete 4 to 5 inches thick placed on it. The surface was leveled off and smoothed with a trowel. These casting floors or beds were made of various sizes to suit the members which were to be made on them. The usual size was 10 feet by 50 feet. We had figured that these casting floors would be much cheaper than floors made of lumber. This was borne out by the cost records which show the beds to cost 4 cents per square foot. This compares very favorably with an account I saw recently of some slabs which were cast in Chicago for street crossings for the Chicago, Burlington & Quincy Railroad. The lumber alone for the floors cost 20 cents per square foot.

The column forms were made of 2-inch lumber planed one side and two edges. They were made 20 inches deep, two inches deeper than the column, so that in getting up on top of a column previously cast, it would clamp 2 inches on the lower column, which would facilitate setting the form. The yokes used were 2x6 inches with a spreader at the top and a ¾-inch bolt through just above the form. We made altogether 7 column forms and with these cast 141 columns. The forms are in good condition now and could easily be used for as many more columns.

The girder forms are built just like the column forms, and used in the same manner. Only 5 girder forms were made and with these we cast 187 girders. Frequently we cast girders with no forms of lumber, and sometimes we used one-half of a form only.

The roof slab forms are somewhat different; these are made 8 inches deep with the upper half identical with the lower half, except that it is offset 4 inches endways. The upper 4 inches is the form proper, while the lower 4 inches are used to clamp on the slab below. The offset is made to enable us to lift the slabs after they are cast. The bevel strips are put on to give the edges of the slab a taper so as to have a place for calking to make a weather-proof joint. Twenty-eight of these forms were made and we have already cast 720 roof slabs, and as we have adopted a 6 feet by 12 feet by 4 inches roof slab as a stand-

*From a paper before the National Association of Cement Users.

ard, we expect to use the forms for many more castings.

The columns are 32 feet long and 18 inches square with two knee braces extending 18 inches at the top. The reinforcing consists of four ⅞-inch high carbon twisted steel rods with hoops of ¼-inch steel spaced 9 inches centers. The foundations for each column were 5-foot cubes made in place with the socket 20 inches square. The depth of these sockets was left low and after all foundations were in we grouted up the bottom to the proper height. By this method we make the slope on the roof, which has a pitch of one foot in 150 feet; all columns were made the same length. The top of the foundation was reinforced to prevent breaking out. Two pieces of pipe were cast in the top of columns for bolting on the plates which hold the column and girder together.

The girder is of straight rectangular form 24 feet by 2 feet 2 inches by 1 foot thick, reinforced by four ⅞-inch high carbon twisted steel rods with hoops, and two small rounds in the top. Pipes were cast in the ends for fastening to the columns and 2 inches by 2 feet wood blocks set in at intervals for the purpose of connecting electric wires.

The roof slabs as before stated are reinforced with twelve ⅝-inch square rods in the line of supports. We also used five ⅝-inch square rods crossways to hold slab together in handling. The edges are beveled ⅝-inch making an opening of ¾-inch at the top when the roof slabs are in place.

In assembling the building, the column is first set in the socket, which has 1 inch clearance all around, is plumbed and then wooden wedges are driven in to hold it. A grout of 1 inch of cement and 3 of sand is then poured in; as soon as this sets sufficiently the wedges are removed and the space filled with more grout.

The tops of the columns and the bottom of the girders where they rest on the columns are soaked with water for some hours before the girders are set in place. This is done by tying burlap on these parts and soaking it. Then a mortar of 1 to 3 is put on top of columns, and the girders set in place, which squeezes out the mortar, making a perfect bed for itself. The roof slabs are then placed on the girders with a mortar joint the same as between column and girder.

We have found with our mixture, which we make very wet, that it is not necessary to water-proof the slabs in any way as they only show a little dampness for a short while, but the pores soon seal up, which leaves only the joint between the roof slabs to be taken care of. This is done by first calking the taper crack with oakum for about 2 inches deep; then we clean and paint the edges and fill the remaining 2 inches with a composition made of 1-3 coal tar and 2-3 cement, boiled together and applied while hot. This has proved to be entirely satisfactory and is a very inexpensive filling.

In addition to the mortar joint between the column and girder, we bolt on a ½-inch steel plate which connects the two girders to the columns. We believe this is unnecessary, but have put it on as an additional precaution. The roof slabs are not fastened in any way, and we depend upon the mortar joint and their weight entirely.

The method used to prevent the slabs, etc., from sticking to each other is the application of a coat of ordinary whitewash. This was used throughout and found to be very satisfactory. It is necessary, however, to put on quite a thick coat of it; we usually put on two coats as a matter of precaution. On some buildings we used sheathing paper as a separator. The objections to paper are that it sticks very closely to the concrete and is hard to remove. Then it is hard to hold in position while casting if there is any wind. It also expands with moisture and sometimes folds leaving the concrete casting irregular. We thought of using a paraffined paper which, of course, would do away with the spotted appearance of the castings. This, however, was not objectionable to us as everything around a cement mill soon comes to the same color. We therefore used the whitewash throughout.

In filling the slabs first a few shovels of concrete are thrown in and spread so as to bring the steel within 3 inches of the bottom; then the steel rods are laid on this, the gate on the car opened and the concrete flows out; the concrete is made very wet and will flow readily. Slabs that were filled one day were whitewashed the following morning and the forms raised; in the afternoon another slab was cast on top.

We now come to the important part of all engineering structures—the cost. Accurate costs were kept of the cast members which will be given later, but before going into these I want to give you some general data in regard to

making the 1048 pieces necessary for the building.

The work on these cast members was started Sept. 25, 1907, and completed Nov. 23, 1907; that is, it was all done in two months. Of course, some preliminary work had been done previously, such as setting up concrete mixer, laying railroad track, and making a few casting floors to start on. The average number of men employed during this time was 23. Eleven of these were classed as carpenters and foremen, whose average rate was 24 cents per hour; twelve were classed as laborers whose average rate was 15 cents per hour.

The lumber used for making the 1048 pieces was 7000 board feet, which at $27.00 per M makes a total of $189.00.

The total amount of steel used was 201,400 pounds, the average price of which delivered at our mill was .0203, or a total cost of $4088.00.

The mixture used was 1 to 6, using the run of crusher stone straight without sand. The stone would all pass a ¾-inch screen.

In the following costs the stone is figured at 60 cents per cubic yard, while the cement is figured at $1.00 per barrel.

Cost of each column complete on casting floor:

Cost of steel	$ 8.57
Cost of material for concrete	5.48
Carpenter labor	4.27
Labor, making and placing concrete and reinforcing	1.95
Total per column	$19.27

The cost per cubic yard concrete without steel is $3.64.

If these columns had been made of yellow pine at $35.00 per M and of the same dimensions, the lumber alone would cost $33.60, as compared with $19.27 for complete concrete column.

Cost of each girder complete on casting floor:

Steel	$ 5.53
Concrete material	3.51
Carpenter labor	2.26
Labor, mixing and placing, etc.	1.34
Total per girder	$12.64

The cost per cubic yard concrete without steel is $4.20.

If it were made of yellow pine at $35.00 per M, and of the same dimensions, the cost of lumber alone would be $21.84, as compared with $12.64 for concrete girder complete.

Cost of each roof slab complete on casting floor:

Steel	$1.69
Concrete material	1.89
Carpenter labor	.423
Labor, mixing and placing concrete, whitewashing, smoothing tops, etc.	405
Total per slab	$4.37

There are 72 square feet in each slab, therefore the cost per square foot is .0607c, or $6.07 per 100 square feet.

Now let us compare this with corrugated iron as a roofing material. Our usual practice on roofs is to use No. 18 gauge corrugated iron:

Weight per square with usual lap is 292 lbs., at $3.05 per 100 lbs. (for the iron alone)	$ 8.92
Paint for 3 cents	.61
Labor painting	.36
Labor putting on	2.75
Total per square in place	$12.64

I have not the actual figures for laying the concrete slabs, but we have a bid from a responsible party to erect the entire roof, columns, and girders for $1932.00. I believe we can do it cheaper by day labor, but let us assume this as the cost and allow the erection of the slabs to be one-half of it, as there are 518 squares in the building:

Cost of erection per square is	$1.86
Cost of slabs per square	6.07
Total cost in place	$7.93
To sum up we have cost of concrete roof slabs in place per square	$ 7.93
Cost of No. 18 gauge corrugated iron in place per square	$13.64

That is, the cost of the corrugated iron is more than 50 per cent. above the cost of the concrete roof slabs.

We tested one of the roof slabs to destruction; it failed at 7700 lbs. center load, with 12 foot span. This gives an ample factor of safety for a roof.

There have been criticisms of this class of construction:

First, the joint between the members is not sufficiently strong.

Second, the expensive machinery necessary to hoist them in place.

In reply to the first, I want to tell you of a case we had in setting up this building. Two of the girders were set on the columns 4 inches out of line. This was discovered after they had been in place 3 days and we attempted to take them up. The crane, which has a lifting capacity of 16 tons, could not move them and it was necessary to separate them by iron wedges driven in the joint. If all the joints are as sound as these after being set only 3 days, I am satisfied that they will answer every purpose.

In reply to the second criticism. We of course used locomotive cranes and railroad for handling the pieces because we had these facilities on hand and it was more economical to do it in this manner. However, they are not at all necessary as in many cases the floor of the building itself could be used for a casting floor and the members raised by an ordinary derrick or gin pole, for the heaviest piece weighed less than 6 tons and it does not take a very large gin pole or derrick to lift 6 tons.

We have not as yet had an occasion to use slabs for the sides of a building, but see no reason why they could not be used as readily for siding as for roofing, if provision were made for bolting them to the columns.

One advantage is that the concrete and reinforcing can be properly inspected while it is being put in, as this can be readily done while working on the ground, but can not be so readily done while working on high stagings. Each member can also be thoroughly inspected as it is removed from the casting floor, and in case any of the members are defective, they can be discarded and others substituted.

SYSTEMS OF REINFORCED CONCRETE CONSTRUCTION.*

By Emile G. Perrot, Architect, Philadelphia.

In reviewing the development of reinforced concrete, one is struck with the numerous attempts to improve upon the earlier adopted systems or methods of construction. In this country, the line of improvements seems to have progressed in one direction, except in one or two notable instances. The trend of thought of American engineers followed the idea of A. L. Ransome, that is, in the use of "formed" or as they are commonly known, "deformed" bars. The European practice, especially that phase of it which was introduced into this country, namely, the "Hennebique System," uses plain bars for the reinforcement; hence, there grew up two well defined "schools," if you so wish to term them, having many advocates on each side. While American engineers in general seemed to bend their efforts towards a bar giving an ideal mechanical bond, it was not until the reinforcement for beams and girders was made into a frame and delivered as a unit that such architects and engineers as heretofore had opposed the use of reinforced concrete beams and girders on account of their uncertainty, took serious notice of this new method of construction and adopted it for use in buildings which heretofore they would have built of steel.

As a consequence of the success of the first girder frames that were put on the market, several attempts have been made by manufacturers to improve upon the original idea in the matter of details.

To those of you experienced in the use of reinforced concrete on a large and extended scale, the uncertainty of each beam and girder (where intended to be the same) being constructed identical in a loose rod system, is very apparent; in fact, I dare say that there is no one who would certify to the fact that every piece of reinforcement was in the exact position laid out by its designer, and I will go farther, that in a great many cases, it is a question whether all the reinforcing metal shown on the drawings actually enters into the construction of the building.

Is it any wonder, then, that those engineers whose experience has led them to use steel construction look askance at this new system of construction, when they could see all manner of ways for the finished work to be short of what was really intended? Many such men have advocated the expenditure of a greater sum of money than would otherwise be the case if reinforced concrete were used, for a system of construction which would give results of which they were certain.

As a matter of fire protection to the steel tension rods in the bottom of beams and girders, these rods should be located 2 inches from the bottom of the beam; in other words, there should be 2 inches of concrete forming an insulation, not ½ inch, or possibly 3 inches, as the case may be in a loose rod system; to secure this insulation, some definite means must be used to hold the rods firmly two inches from the bottom of the mold. This is only secured by some positive mechanical means; in loose rod systems the means, as a rule, are altogether wanting, dependence being placed on the concrete for holding the bars in position, or the stirrups are made to form hangers which permit the rods to loosely hang in the form.

If the rods are united into a frame, a suitable chair can be fastened to the bars to support them a definite

*From a paper before the National Association of Cement Users.

distance from the bottom of the form. Several systems employ this method. Better, however, is the use of a socket locking the bars together and bolted to the bottom of the form. This socket can be made to support any number of frames on top of each other, and thus register the position of the bars in regard to their position in the mold as well as to each other.

Another important reason why the rods should be rigidly located in the mold before the concrete is poured is to insure the strength of the beam being the same as that originally figured, for if the bars should be loosely held in the mold, and in the process of tamping be moved farther from the bottom, the insulation from fire would be improved at the expense of the strength of the beam; for instance, in a Tee beam with a depth of rib of 16 inches below the under side of the slab, the loss in strength of the concrete beam, due to the shifting of the bars one inch farther away from the bottom would be almost seven per cent. Thus, it is seen that when an engineer designs a building with beams of a certain depth and the center of action of steel at a definite distance from the bottom of the beam, there is no certainty that his finished beam in the building has the calculated strength if there has been no means of holding the bars rigidly in place. Thus a building can be materially weakened by the inaccuracies creeping in on the work, for if there is a loss of seven per cent. by reason of the bars being misplaced, and another ten per cent. loss, or possibly more, by reason of the concrete not being properly mixed and tamped, the resulting construction, while it would not show on the face of it that it was so weakened, would be nevertheless, and the factor of safety would be reduced by just such an amount.

I have seen a large building constructed of reinforced concrete in which all the floor beams and girders were reinforced with a unit frame, and where these frames were used, not one bar was exposed ot view on the removal of the forms; but in the same building some unimportant beams in the stairway were reinforced with loose rods, and in one case, after the removal of the forms, a rod was visible having been pushed out of place in the tamping process; how many other bars, where the loose ones were used, have been displaced. it is impossible to tell.

Thorough tamping of the concrete in the beams and girders is possible only with a frame or where the bars are held rigidly in place; this feature of the work is not always appreciated by constructors, but experiments show that a dense, well tamped concrete is twenty-five per cent. stronger than one not tamped. Hence, there is a decided advantage to be gained by using a frame and thoroughly tamping the concrete.

The frame can be made of any type of bar, either plain or deformed, as the bars are assembled and held together by the stirrups, it makes very little difference what the shape is. In fact, one large building in Baltimore, the Lord Baltimore Press, is constructed with frames made of Kahn bars.

The latest idea in the design of girder frames is the pin-connected frame, which consists in making a mechanical tie by means of a link from one beam to another, thus making a continuous beam.

The idea has been sucessfully applied to column construction by several designers, Mr. Cumming of Pittsburgh, employing a cage for hooped columns. I myself have used a column of the hooped type for heavy loads. The hooping consists of wire rope wound as a helix wired to vertical rods and the rods secured to bands at top and bottom and at intervals of the height. These columns were made in a shop and delivered by team just the same as a steel column and set up in position with the forms built around them and then filled with concrete; additional longitudinal rods were placed in the center of the column to increase its compressive strength. All column rods are faced on the ends and set in line with those above.

Reinforcement for slabs may consist of any fabric or webbing such as expanded metal, wire cloth, or even plain rods with cross rods on top and wired together, or fastened together with spring stool lock and spacer. These webbings should interlock with the stirrups of the beams and girders, which can be done by having the stirrups long enough to pass up through the mesh of the fabric and be bent over with long pliers so as to hook over the wires of the webbing. In this way the floor slab cannot separate from the beam or girder, and as the greatest horizontal shear is likely to be at this place, the interlocking of stirrups and fabric makes a most excellent construction.

It very frequently happens that the standard sizes of fabric do not give sufficient area of metal per running foot; in these cases additional rods can be wired to the top of the fabric to make up the sectional area which is lacking.

Where a webbing is not used for slab reinforcement, the stirrups should in some manner engage the slab rods.

INTERURBAN RAILWAYS.*

By Hugh J. McGowan, Indianapolis, Ind.

The successful operation of electric street railways in general dates back twenty years. First confined to the streets of cities, they gradually extended in the suburbs, thence to nearby towns or as far as direct current would take them. It was not until the introduction of the alternating current some ten years ago, which made possible the transmission of electric energy over great distances, that interurban railways became a well established factor in transportation. Our purpose is to refer briefly and in a general way to the interurban railway, its present development and its future possibilities, without entering into the details of its history or burdening you with elaborate statistics. It should be mentioned, however, in passing, that some of the earliest and most successful experiments in traction development were made in this great city of Chicago.

An interurban railway may be defined as a high speed electric railroad having nearly all its mileage outside the limits of municipalities and running, as the name implies, between cities, serving at the same time intermediate towns and villages. Transmission of power is generally by overhead trolley although the third rail is used in some sections of the country to a limited extent. Heavily ballasted road-beds with from seventy to ninety-pound rails constitute typical construction. The up-to-date equipment consists of large and elegantly appointed double truck cars, approximately sixty-two feet in length, weighing from forty to fifty tons, provided with smoking and baggage compartments, and with a seating capacity for sixty-six passengers. These cars are usually propelled by four 85 horse-power motors, or four 100 horse-power motors.

To accommodate those desiring quick service between cities and towns, and those living in the rural districts, two distinct services are maintained—one known as limited cars competing with the first class trains on steam railroads and running every hour or two, and stopping only at the principal towns along the line; the other called local or regular cars, despatched at frequent intervals and making stops every half or three-fourths of a mile, enabling dwellers in the country and on the farm to reach their very door, or board a car at their gate for the next village or city. The local cars might be called country omnibuses for they convey the children to and from school and carry their parents and friends between towns and villages, at the same time maintaining a speed of twenty to thirty miles an hour.

Most of the interurban lines do an extensive freight and express business, principally in the lighter class of package freight. For this purpose large and commodious freight and express cars are provided. The interurban freight and express service has opened up new markets for the produce and poultry of the farmer and has done much to develop and stimulate gardening along the lines, the raising of vegetables, fruits and flowers, and the establishment of first class dairies. The slow and cumbersome produce wagon trudging into town is superseded by the interurban freight express.

The growth and success of interurban railways is not confined to any particular section of the country. They flourish in New England and the Middle Atlantic States as they do in the Western and Pacific States. They were early known in the South and were welcomed in the North. But I may be pardoned in stating that it is believed by many that they have reached their highest efficiency in the States of Illinois, Indiana and Ohio, which may be characterized as "The Big Three."

The total interurban railway mileage in this trio of states approximates 5,000 miles, representing an investment of many millions of dollars.

*From an address before the National Business League of America.

As an indication of the possibilities of through travel it may be mentioned that upon the completion of a gap of fifty miles, one may journey in interurban cars from East St. Louis to Chicago, and upon the building of a short connecting link between Danville, Illinois and Crawfordsville, Indiana, it will be possible to go from St. Louis to Buffalo by electric traction. At present the interests which I represent, own a through line in full operation between Paris, Illinois, and Zanesville, Ohio, a distance of over 300 miles, and will in the near future install a through service between Indianapolis and Toledo, as well as between Cincinnati and Toledo, thence to Cleveland and Buffalo.

A glance at a map of the combined interurban lines in the three states named will quickly remind one of the familiar comparison to the spider's web. Few cities, towns, villages or hamlets may now be found that are not touched by the ramifications of interurban railways.

Indianapolis is located in the center of this great net-work of electric lines and occupies a unique position in the traction world. From the middle of a large block owned by the Traction Company, situated in the heart of the city, on on side of which is the State house and on the other, the most beautiful and lofty Soldiers' and Sailors' Monument in the United States, rises the now famous Traction Building, erected three years ago at a cost exceeding one million dollars, with its spacious and handsome terminal station adjoining, conceded to be the finest in the world. Nine tracks enter this station, accommodating twelve interurban lines and divisions which run in all directions. Four hundred cars on an average arrive and depart daily, which on a steam railroad would

HUGH J. McGOWAN, INDIANAPOLIS, IND.

be equal to one hundred trains of four cars each. In 1906, more than five million passengers were carried to and from this terminal station, and it is estimated that in 1907 the number will reach six million. These figures do not include passengers carried between points outside the city limits.

This terminal station stands as a justification of the faith of my associates and myself in interurban railways. When first projected there was naturally some doubt as to whether the volume of prospective business would warrant the erection of such a building which would be the first of its kind in existence, but our confidence was never shaken and it has since transpired that we have found it necessary to purchase more ground to provide for additional facilities for the constantly increasing traffic. Since its completion, buildings of a similar character have been erected in other cities, both in this country and in Europe.

The benefits resulting to the people of Indiana, with its 1,500 miles of interurban roads controlled by various companies, are duplicated in every other state of the Union enjoying a like means of transportation. Employment has been created for thousands. Social conditions have wonderfully improved. Crowded cities, thriving towns and villages, hamlets and rural districts are all happily united and share alike the advantages of interurban lines. There is an awakening and thrill of life in every town and village through which an interurban line runs, never felt before. Commercial opportunities which lay dormant are made possible and become profitable realities. New markets are opened. The reciprocal relations which develop between the city and town, and between the village and farm are beneficial to all. The dweller in the small town, while escaping the expense of living in a big city, may still enjoy all its advantages. He receives by means of the interurban cars, his morning paper every day before breakfast and his afternoon paper before his evening meal, and is in touch with the news of the world. The weekly newspaper is getting to be a thing of the past. His sons and daughters may attend the institutions of higher education in the city and return to the parental fireside every evening. The theatres and grand concerts are likewise available. No longer is the narrow view entertained that interurban roads benefit the large cities at the expense of the towns.

Summing up interurban development throughout the United States, we find that this new means of transportation has won favor with rich and poor alike. Hundreds of thousands of dollars have been saved to the people in reduced fares, while the enhancement in the value of lands contiguous to interurban lines has reached millions of dollars. It is difficult to obtain correct statistics regarding electric roads which may be strictly classified as interurban railways, but in general terms it may be stated that the present and projected interurban railway mileage is equal to nearly one-tenth of the total mileage of the steam roads of this country. Their capitalization reaches hundreds of millions of dollars and they give employment to an army of tens of thousands of men.

Investments in interurban lines which have been properly located, financed, constructed and operated, have yielded substantial profits and their securities are sought by conservative investors. The freight and express business, though confined principally to the handling of the lighter classes of merchandise, has increased materially and is a large source of revenue. The carrying of mails is being steadily developed.

The question is often asked: Are interurban railways injurious to steam railroads? Sufficient time has elapsed since the establishment of interurban roads to warrant our answering this in the negative. Each has its sphere. One benefits the other. There is ample business for both. We are a growing race, following the biblical injunction to "increase and multiply", so wisely promulgated by our Chief Executive. To show how inadequate are the present means of transportation for our ninety millions of population, we need only cite the statement of Mr. James J. Hill, that it would require five billion dollars to properly equip the steam roads of this country to handle the increasing traffic. It should also be remembered that the steam roads derive the greater part of their revenue from the carriage of heavy freight, in which they have practically no competition.

In this brief and imperfect presentation of the subject allotted me I have endeavored to show something of the present development of interurban railways. What of their future? Their future is as limitless as the bounds of electricity. They are harnessed to a power infinite in its possibilities. Interurban railways have come to stay. Each succeeding year will mark their

further extension, improvement and efficiency. We who are now interested in them are but witnessing their beginning. Who will predict to what a standard of perfection they will reach when in operation as many years as the steam railroads are at present? To us is not given the gift of prophesy, and yet, I may be permitted to say in conclusion that in the upbuilding of this nation and in all that makes for a happy and prosperous people, no greater element to that end will be found than the interurban railways in the United States.

THE NEW ORLEANS SEWERAGE CASE.

By Alexander Potter, Consulting Engineer, New York City.

The case of T. J. Shea vs. the Sewerage and Water Board of New Orleans for $125,000 damages is one which arose out of the construction of the sewerage system for the city of New Orleans, a city which remained without a proper drainage or sanitary system until its inhabitants approached 300,000 in number, with homes built on land at an average elevation of twelve feet below the high water level of the Mississippi river and protected from its inundations only by great levees erected by the Government along the river front. The menace to the health of the community due to the lack of sanitary improvements under such circumstances can be easily imagined, as well as, also, the condition of the soil upon which the New Orleans sewers were to be laid.

The suit brought by Mr. Shea is based on an open account claimed to be due under contract and for damages caused by the city's agents in executing the contracts had with him.

There was no denial upon the trial of the issue that there had been serious failures in certain portions of the work nor that this defective work had caused long stretches of the sewers to sink, rendering the sewers useless and making necessary expensive and oft-repeated repairs, both on the part of the contractor and of the city. The question brought before the court was therefore, assuming that there had been failures in the work whose fault was it?

In this light, the matter becomes of interest to both engineers and contractors, and the dictum of Judge King of New Orleans in this suit, seems to have been in line with that already advanced in cases of this kind, viz.:

If the plaintiff was untrammeled in the exercise of his discretion in the means to prosecute the work and the manner and mode of construction, the time when, and the force and material with which the same should be carried on, and failure resulted, it is clearly his duty to repair his failures. Furthermore, he would be rosponsible for all loss and damage inflicted thereby. If, however, the plaintiff was only an administrative agency, to mechanically execute the orders of the defendant, orders given by its engineers, and in executing their orders failures resulted, plaintiff is not responsible, unless the failures are attributable to his negligence, laches, dereliction or fault in executing the orders given.

The contract plainly imposed upon the plaintiff, and he assumed to furnish, all the necessary materials for and labor to build in a good, firm and substantial manner the sewers and other work described in his contracts, in the manner specified in the special and general specifications, under the supervision and direction of the engineer of said Sewerage and Water Board or his authorized representative.

The special specifications for sewers in the New Orleans work contain fifty-four sections, but in not one of the fifty-four sections is any discretion given to the contractor, the plaintiff.

Section thirty-six of the general specifications, moreover, provides: "The bottom of the trench for all kinds or description of sewers shall be carefully graded, formed and aligned according to the directions furnished by the engineer, and to his full satisfaction, before any sewers are laid therein."

Section thirty-nine of the general specifications provides: "Where the bottom of the trench does not, in the opinion of the engineer, make a suitable foundation for the sewer, the trench shall be deepened, and such foundation under the sewer as the engineer will direct shall be placed therein."

Section forty prescribes how excavations below grade ordered by the engineer, and foundation material used

under sewers and lumber under sewer pipes will be paid for. Section two hundred thirty-one contained the general and familiar provision: "The work shall be prosecuted in such manner, and from such points, at such times, and with such forces, as the engineer may determine from time to time during the progress of the work."

To quote the words of the decision:

> There is not a single section in the contract or the special and general specifications that gives the plaintiff any discretion in executing the work. Throughout, it is emphasized, time and again, that he is to do the work in strict accordance with the plans, the specifications and the directions of the engineers and those who represent them, to their entire satisfaction.

Every detail is regulated and prescribed by the preamble, contract and specifications, especially the way the sewer pipe is to be laid in the bottom of the trench, regulating the character of the work and the manner of its doing, even in the minutest manner, all to be done to the satisfaction of the engineer, and even prescribing that no work is to be paid for unless performed in the presence of the engineers or inspectors. "It is clear," the court says, "that the method of work was solely that of the defendant"—the city.

Of this contract and specifications, Mr. Hering, the consulting engineer, upon the New Orleans sewerage system since 1892, says in his testimony: "I believe them to be among the best in the United States, in fact, in the world, as I stated before, of course, for that kind of work, at such a place as this."

It was shown upon the trial that defendant's engineers and inspectors had at all times actual control of the work; that the contractor could not do and did not do any work without their presence, permission and approval. All the defendant's inspectors testified in substance that they had inspected every pipe laid and every joint made in the trenches. They even testified that they went down into the trenches to do it; that they even got into the pipes to see how they were joined inside, and saw how they were joined outside from the bank; and that they were also satisfied with the character of the backfill.

There was not a line of testimony to the effect that the contractor ever refused to obey any order given him by an engineer or inspector, or that they ever complained to him at the time of the manner in which he performed his work. In spite of all this the pipe went down and the sewers failed in many places; even after being repaired by the city again and again.

In order that conditions surrounding the laying of the sewers might be thoroughly understood much testimony was introduced as to the nature of the soil underlying New Orleans and the conditions encountered in the trenches when opened for the laying of pipe.

It is well known, of course, that the city lies in a delta of the Mississippi, upon soil formed by deposits made by the river, and that its general elevation is lower than the normal river level. A stratum of blue clay, varying in thickness, seems generally to overlie the surface of the city, interspersed and broken with layers and pockets of sand, thoroughly saturated with water. So irregular is the stratum of clay that it often varies in thickness from a few inches to many feet. Sometimes layers of clay and sand in varying depths underlie each other, broken by pockets of sand from one to thirty feet in depth, and succeeding each other at frequent and uncertain intervals, so that it was impossible to determine the nature of the soil except by boring at short intervals.

Most of the failures on the Shea trenches occurred on 24-inch pipe, laid in trenches from 14 feet to 18 feet in depth; although long stretches of pipe, both of larger and smaller dimensions, also failed on work in other portions of the city.

Profiles in the office of the Sewerage Board showed a sand formation in many places at the grade line of the sewer, and daily reports of the inspector upon some of the faulty work showed that the conditions encountered varied from day to day from hard blue clay, in layers of varying thickness, to boiling sand. It was shown upon the trial that even when boiling sand was not actually encountered, these large pipe sewers were laid without foundation, or with inadequate foundation, and against the protest of the contractor, upon a layer of blue clay, not over two inches in thickness oftentimes, beneath which was quicksand and water which sometimes forced its way through the thin layer of clay, and when pierced in an effort to lay the pipe, boiled up and flooded the trench, forcing the men to stand on planks to prevent their sinking to the knees in the boiling quicksand. It was shown that when such conditions as these were encountered, the contractor again and again no-

tified the engineers and inspectors that unless he was allowed to use some proper foundation, it was his opinion that the sewers would not stand; but that oftentimes the engineers refused to order in foundation of any sort, or only a partial or inadequate foundation of two-inch plank.

It was shown that when conditions reached an extreme, the contractor wrote to Mr. George G. Earl, the superintendent, telling him that under the large pipe sewers no uniformity of foundation was being employed and that it had been the practice of the inspectors to place a few boards crosswise of the ditch where a very soft spot was encountered, but to dispense with even this just as soon as the earth showed the least bit of firmness, regardless of the amount of water or seepage into the ditch, which would have a tendency to weaken the foundation by making it soft, so that when the backfilling was placed it would do damage to the pipe line; and stating that if a uniform foundation of concrete were placed under the pipe sewers, or a uniform plank foundation, the lines could be "laid dry and as straight as a gun barrel"; stating that he did not feel responsible unless this precaution was taken. In this letter he begs Mr. Earl to take a personal interest in the matter; but upon the trial it was shown that neither Mr. Earl, the chief engineer, nor the consulting engineers, ever came down to see these dangerous points upon the work of which notice was given, or that they ever read the inspector's reports, and knew nothing of their own personal knowledge of the conditions encountered at these crucial points. The plaintiff was powerless, having no discretion in regard to the laying of his sewers.

These are, briefly stated, the underlying facts of the case. The matter resolved itself, therefore, into two questions; first, whether lack of foundation or insufficient foundation was the cause of the sinking and breaking of the pipes; and, second, whether bad, careless, or unskilled workmanship or neglect of the contractor in the laying of the pipes was the cause of their failure.

Upon these two points, six expert engineers were called to testify. Those called by the city were Major B. M. Harrod, Past. Prest. Am. Soc. C. E.; Rudolph Hering, M. Am. Soc. C. E:; J. L. Ludlow, M. Am. Soc. C. E.; W. G. Kirkpatrick, M. Am. Soc. C. E. and J. W. L. Stephens; by the contractor, the writer.

As none of the experts had been eyewitnesses to the condition of the trenches on any portion of the Shea contracts at the time the pipes were laid, ninety samples of soil, contained in quart and half-gallon jars, taken at random from the bottom of trenches when opened for repairs, more than a year after plaintiff had laid the pipes therein, had been prepared by the city's representatives, and were presented to the experts for their examination. From their examination they were asked to state whether, in their opinion, a 24-inch pipe could be laid in a trench fourteen feet deep with a soil at the bottom like the soil contained in the samples, without an artificial foundation.

They were also shown nineteen samples of broken pipe, purported to have been taken from the ditches when being repaired, requested to examine them, and to state, in their opinion, from their appearance, whether the joints were properly made up, and if not, was that the cause of the sewer pipe sinking.

They were asked, in giving their opinion, to base it on their knowledge of soil and sewer building acquired in the course of their profession. They were then asked hypothetical questions, and examined and cross-examined for several weeks on almost every issue of fact raised in the case: upon their experience in sewer building; and upon the character of the soil, foundation, bracing and sheeting of the trench, laying of the pipe, creeping of the pipe, back-filling, the laying of conduits over the sewer pipes, weight of the soil, effect of spoil banks, cause of the sinking and the cause of the cracking of the pipe.

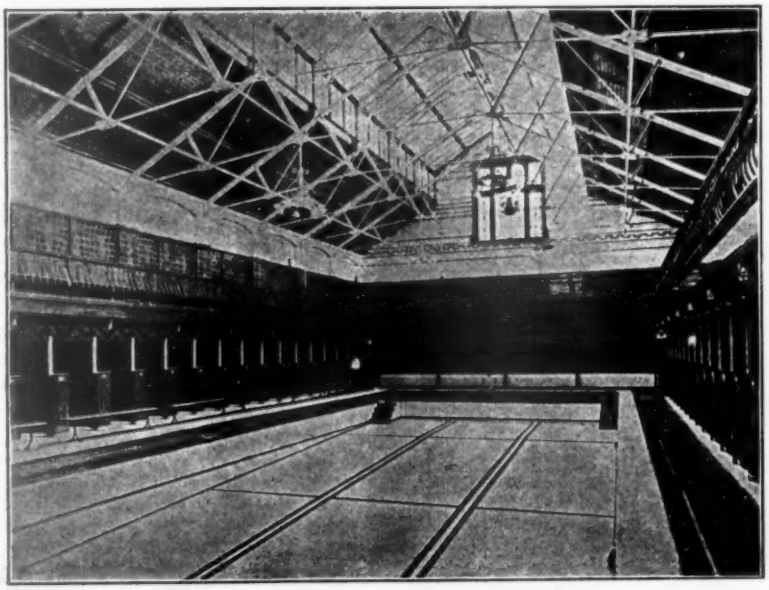
On the proposition that the contractor can not be held for work over which he has no control, there can be little difference of opinion, and in this particular the decision at New Orleans is only cumulative evidence of the correctness of this proposition. The phase of the New Orleans case of most importance to engineers, therefore, was the effort of the city to prove, either contributory negligence on the part of the contractor, or, more particularly, bad, careless, and unskilled workmanship, and on this point the opinion of the experts was vital. The question involved in this attempt will be considered later.

PUBLIC BATHS.

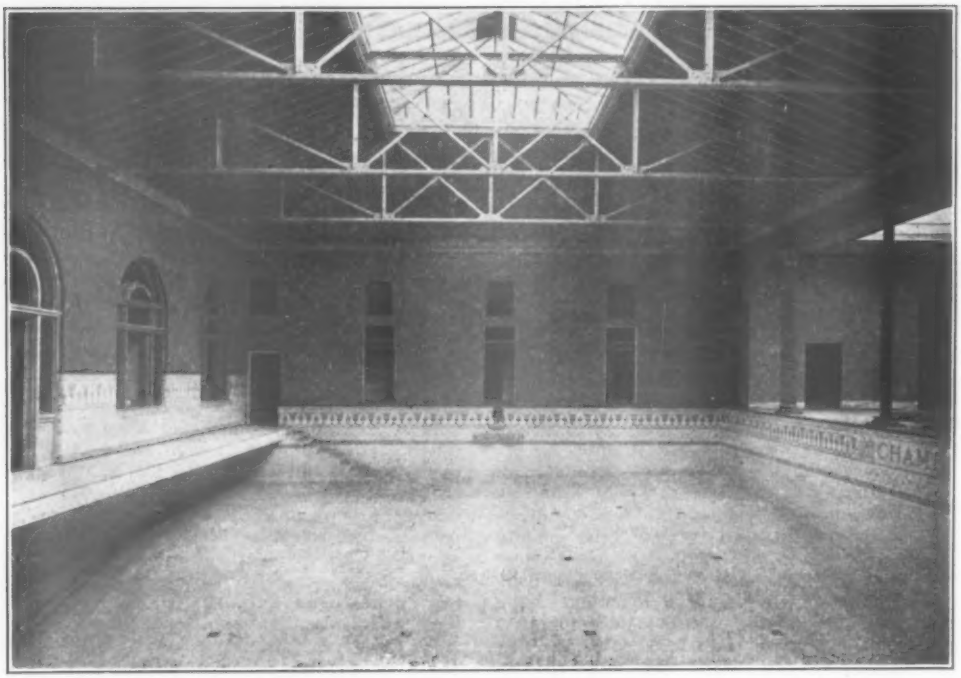
By C. J. Fox, Ph. D., Washington, D. C.

Man, like many animals, naturally enjoys a bath. In hot climates especially, bathing is so salutary, in fact so absolutely essential to health, that it became a religious rite among the Buddhists, Mohammedans and other oriental peoples. The Bible and the Koran contain frequent references to bathing, and the hot bath is mentioned in the Iliad and Odyssey. It was, however, the Romans who popularized bathing and put it upon an almost scientific basis. The great public baths of Rome were popular lounging places corresponding somewhat to the modern club, where the people gathered in multitudes for recreation, and entertainment. The baths of Caracalla, which form the most extensive ruins in Rome, provided accommodations for more than 2000 bathers. The great Roman baths not only in the capital but in Herculaneum, in Pompeii and in other Italian cities were monuments of engineering and architectural achievements. Many of them contained lecture rooms, porticos, libraries and other luxurious appurtenances. Although they were built without regard for cost and adorned with splendid extravagance, at many of the baths no fee was charged and at others it was but the smallest current coin.

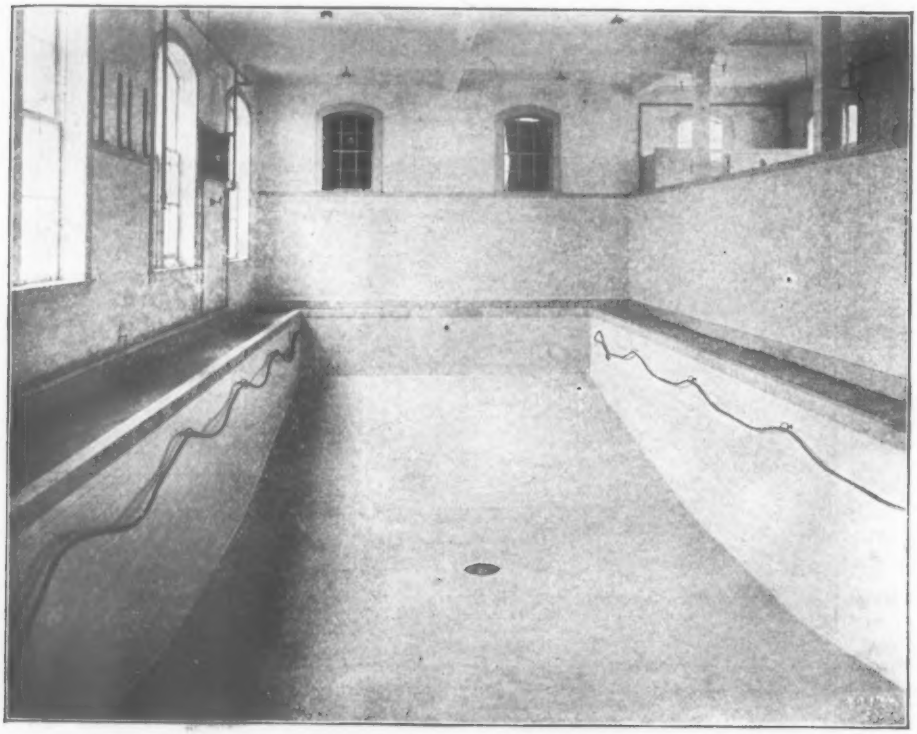
The modern public swimming baths are perhaps the nearest approach to the ancient Roman thermae. It seems anomalous that America, which leads the world in the universal adoption of the private bath room, should be far behind England, France, Germany and other European countries in the number and size of its public swimming baths. In America no private residence of any pretensions whatsoever is regarded as complete unless it is supplied with at least one modern bath room, fitted out with sanitary plumbing fixtures and with beautifully tiled floor and walls. There are in America many Russian-Turkish baths, athletic clubs, Young Men's Christian Associations and hotels which contain most luxurious swimming baths, but as a rule the privileges are reserved to members or the price is such as to be prohibitive to the average man in the street. In London, Paris, Berlin and other European cities, however, there are many large public swimming



SWIMMING POOL TILED THROUGHOUT.



SWIMMING POOL LINED IN CERAMIC MOSAIC.



TILED POOL IN A Y. M. C. A. BUILDING.

baths where the price is merely nominal and the service is such as to encourage the patronage of the very class which are most in need of such baths. The salutary effect of the public swimming bath is considerable, not only because of the healthful physical exercise of swimming and of the recreation and entertainment involved in the common enjoyment of a healthful sport. Many of these European baths have separate pools for women, and in others special days are set apart for each sex. In some of the districts inhabited by the poorer classes, the baths are free for several days each week and on other days only a slight charge is made.

In the erection and maintenance of these baths, most scrupulous regard has been had for cleanliness and sanitation. The pool itself, the floors and walls of all rooms, even the small dressing compartments are usually covered with glazed vitreous tile, which is not only non-absorbent and germ proof, but is also easy to keep clean. The use of wood or any other absorbent material about the baths is discouraged. In fact the modern European swimming bath can be quite favorably compared with the modern hospital as far as its sanitary interior construction is concerned. Some of the baths are lined with beautiful marble slabs, but as a rule, they are tiled because of the germ proof qualities of the burned clay product make the tile the most sanitary of all bath linings or floor and wall coverings.

But, however essential cleanliness and sanitation may be, they are not the only consideration in the erection of the European swimming bath. The pool, the rooms for shower and steam baths, and the dressing and lounging rooms, are as a rule decorated in the most attractive manner, frequently by elaborate designs worked out in ceramic mosaic on the floor and walls. These decorations are absolutely uninjured by the water, steam or dampness and can be easily kept in a clean and sanitary condition. Such treatment adds materially to the attractive appearance of the baths and its sanitary features give one that assurance of absolute cleanliness which is so essential in a bathing establishment which is patronized by many people in common.

It is to be hoped that the adoption of the public or municipal bath will soon become as general in America as it is in European countries. From the standpoint of public health, there is much said in favor of the municipal swimming bath. It encourages personal cleanliness, which even from the standpoint of the community is a most important consideration. It encourages healthful physical exercise which is so essential in our overcrowded cities. It also supplies an inexpensive and healthful recreation and amusement. There are in America today, many excellent swimming baths of semi-public character which would serve well as models for the establishments which should be erected by the municipalities, and maintained at least partially at public expense. It is quite as logical for the city authorities to erect public swimming baths in order to preserve the health of the members of the community as it is to build hospitals to cure sickness and disease.

ILLEGAL GUARANTIES OF PAVEMENTS.

By J. W. Howard, Consulting Engineer on Pavements, New York City.

The following compilation of legal decisions on guaranties of pavements, paid for by assessments, is of special value for city attorneys, city engineers and other municipal officers, also for property owners assessed to pay for pavements with maintenance or repairs, when pavements are subject to time guaranties by contractors. There are similar decisions in other states. All are precedents which must be recognized by city officials and which are likely, at any moment, to be used by property owners refusing to pay certain pavement assessments and thus invalidate enormous amounts of special pavement assessment paper, certain pavement temporary loans, etc., which have been issued by cities.

1. The case of People ex rel. v. Maher, 9 New York, Supplement 94, Supreme Court, 1899, contains sensible opinion on this subject, holding that a requirement that the contractor keep the pavement in repair for seven years after the acceptance by the city, puts the burden of the cost of repairs upon the abutting owners, whereas the

charter provided that repairs should be paid for by the city at large.

The decision makes the following points:

The charter of the city of Albany provided that the repairing of streets should be charged upon the city. An ordinance to pave Delaware avenue directed that the contract should require the contractor to agree to keep the pavement in repair for seven years without expense to the city or abutting property owners.

It was held that the contract was void since it threw upon the property owners the expense of keeping the pavement in repair, whereas such expense was chargeable only upon the city.

Under a petition for the pavement of Delaware avenue, authorized by the law, the common council passed an ordinance for such paving. This directed the board of contract and apportionment to require the contractor to agree to keep the said pavement in repair for seven years from and after its acceptance by the city, without expense to said city or abutting property owners. Under this ordinance, specifications were prepared containing, among other things, a clause to that effect. A proposal for the work was made, and the accompanying bond bound the proposer to the same effect. The contract was awarded to the proposer, and the written contract refers to the specifications and the ordinance. Hence, the contractor is bound, according to the terms of the contract, to keep the pavement in repair for seven years after its acceptance. The relators objected that the necessary effect of this contract was to charge upon the property owners the cost of keeping the avenue in repair for seven years, when such expense is only chargeable on the city. The board overruled the objection. The contractor, who alone appears here to sustain the award, urges that the proof shows that the bid did not include any item for repairs, and therefore the property owners are not injured. A further argument is made, viz.: that since 1883 every contract for paving has required the contractor keep the pavement in repair for a year. But this may reasonably be considered a time within which to test the pavement. Defects in the construction may not appear immediately and this time of one year may be proper, in order that any such defects may become apparent. By the present contract five per cent. of the price is to be retained for not more than one year as a guaranty that the work will be kept in good condition. It is evident that a provision of this kind is different from an agreement that the contractor will keep the road in repair for seven years. It is not subject to the objection made by the relator, being in substance only a security for the thorough completion of the work, and unobjectionable, so far as we can now see.

It is urged with some force that this agreement is only equivalent to a warranty that the pavement will last seven years without repair, and that such a warranty would be a benefit to all interested in the work. Undoubtedly such a warranty would be a benefit, as this provision may be. But the difficulty arises from the circumstance that the property owners are to pay only for the paving, and the city is to pay for subsequent repairs. Anything, therefore, which casts on the property owners more than the burden of having the pavement well constructed in the outset is unjust to them. We can see this by extending the time provided for. Let us suppose that the contract was to keep the pavement in repair for 100 years, or perpetually. Is there any doubt that by such a contract the property owners would be required to pay a higher price than the mere cost of paving thoroughly done?

This is a proceeding to review the action of the board in letting the contract; and the matter simply stands thus. It is the duty of the city to make the repairs. But by this contract they make the property owners liable to pay, not only for the laying of the pavement, but for making repairs for seven years. This it has no right to do; and it cannot make such a proceeding valid by testimony that the contractor did not include a charge for repairs in his bid. If, as the contractor claims, no repairs will be needed, then there was no need for such a clause. Evidently, the city thought repairs might be needed, and arranged that the property owners should pay therefor in advance. They have a right to insist that the specifications for which proposals are to be made, and the contract entered into thereon, shall be limited to that work which they are bound to pay, viz., the construction of the proposed work, as distinguished from subsequent repairs. The decision of the board is reversed, and the contract adjudged illegal, with $50 costs and disbursements. All concur.

2. In the case of Friedman v. Village of Norwood, 1 C. C. R. N. S. 9 Ohio, for five years to secure the making of repairs for that length of time by the contractor, the court held that if this was for maintenance and repairs it could not be assessed against the abutting property; "the most perfectly constructed macadam will not wear five years; the contractor can hardly have guaranteed the impossible." Some of the fifteen per cent. was held to have been for maintenance, and this unlawful element was held to vitiate the assessment, so that burden was on the village to prove how much of the fifteen per cent. was for repair purposes. The court found a certain amount was for repairs and maintenance and was therefore invalid.

3. Brown v. Jenks, 98 Calif. 10, the contractor was required to keep the streets "in thorough repair for the term of five years," the court held that this might increase the burden of the property owners. The contractor would manifestly charge more for the work where forced to contract for repairs, "the expense undertaken is indefinite and the property owners must pay for them in advance, whereas the statute provides for repairs

after the necessity for them appears." This was not a guaranty that the work was well done and would not require repairs for five years, but the Court said that even if it was, "the provision is clearly unauthorized; the lot owners would be made to pay for such a guaranty, which would make the assessment before the time had elapsed. It is the duty of the proper officers to see that the work is well done. A bond would be substituted for the performance of this duty. * * * if the contractor is willing to testify that the anticipated costs of repairing did not enhance the price, such testimony would not help the matter; others might have applied for the work and lost the same if this requirement had not been made." The assessment was void.

4. Portland v. Bituminous Paving Company, 33 Oregon, 308, decided that in a contract for street paving a provision requiring the contractor to keep the street in repair for a number of years was illegal.

5. Scranton City, Appellant, v. Sturges, 202 Penna. 182, 1902, Supreme Court. A nonsuit was entered by the court below. That court held that the contract and ordinance, providing that the pavement to be paid for by abutting property should be kept in repair for five years against ordinary wear and tear, there being no evidence that the cost of such repairs could be separated from that of the original paving, were illegal.

The contract stated that "the said contractor shall keep said pavement in good repair to the satisfaction of the street commissioners for a period of five years from the completion thereof. Such repairs to include all breaking of the pavement for gas or water or sewer purposes, as well as the ordinary wear and tear so far as the city is concerned, but the said company may collect from the gas and water company, or any property owner, the cost of making repairs when breakages are repaired for their convenience. The cost of such repairs not to exceed $2.62 per square yard."

See 7 Lack. Legal News, 67. The court said:

The provision is not in the nature of a guaranty that the work will be well done; that is provided for in the specifications, which prescribed in detail the kind and quality of material which shall be used, also the manner in which the work shall be done; but having done the work in accordance with the specifications, they were also to keep the pavement in repair for five years, these repairs to include the ordinary wear and tear, and to be without expense to the city, thus imposing upon the abutting property owners the additional burden of repairing the pavement for the period mentioned, the expense of which was presumably estimated and taken into account by the contractor in fixing the price for which the pavement would be laid.

That the property owner cannot be required to bear the expense of repairing the pavement, once it is laid, is settled in this state. Williamsport v. Beck, 128 Penna. 147.

On error the Supreme Court held:

Before five years the pavement, apparently being of poor quality, broke and became in many places impassable. Defendant had paid his assessment of the original cost, but refused to pay for repairs. The city brought this suit in assumpsit for the benefit of the contractor to recover defendant's portion of the cost of repairs.

We held in McKeesport Boro v. Fiddler, 147 Penna. 532, an assessment by a municipality for paving a street is a tax, and cannot be collected as an ordinary debt by a common law action unless such remedy is given by statute. * * * There can be no recovery in assumpsit for an assessment without clear legislative authority.

But besides this fatal objection to the form of action, the property owner cannot be required to bear the expense of repairing the pavement once it has been laid. Judgment affirmed.

6. In Verdin v. St. Louis, Mo. 131, No. 26, the Court held that maintenance of a street was repairs, and that since the city was required to pay for repairs, they could not be assessed on the abutting owners; therefore a guaranty clause would be invalid.

7. Boyd v. Milwaukee, 92 Wis. 456, held that a requirement to keep the pavement in good repair for five years, except to repairs due to cutting through the pavement for purposes of access to the pipes, etc., rendered the assessment against the adjoining owners invalid.

8. Wilson v. Trenton, 61 New Jersey, L. 599, 1898, Court of Errors and Appeals. Certiorari to set aside a contract for paving. The contract contained a five-year guaranty clause, guaranteeing durability and agreeing to maintain the pavement in good condition and to repave at a price stated all openings made in the street during five years. Held: Property owners are not chargeable with the price of improvements but only with an equivalent for the special benefits they derive therefrom. Such an equivalent cannot exceed the reasonable value of improvement, and hence the municipality itself, not the assessable property owners, must bear the excess of price beyond fair cost. If, therefore, the commissioners who levy an assessment for this improvement charge

upon the property owners anything beyond the fair cost of laying a good pavement, their assessment will to that extent be illegal.

9. City of Covington v. Dressman, 6 Bush, Ky. 210, 1896, Court of Appeals. Suit by contractor against lot owners and the city to recover an assessment for street paving.

The covenant by the contractor to keep the work in good order and repair for the period of one year after it was approved was held in Louisville v. Henderson, 5 Bush, 515, under the evidence in that case, to mean simply a guaranty that the work was well done, and if so it would need no repair within that time.

It is certainly not a felicitous way of expressing a guaranty for sound, good work yet that may be what it means; at least it would be so presumptively held on demurrer when, if such is not the case, this may be put in issue and elucidated by the evidence; and on trial, if it should appear that this imposes an additional burden on the property holders, and is not a mere guaranty by the contractor that he will well perform his work, they should to that extent be released; for it is the duty of the city to keep such streets in repair, and not impose this on the property holders.

10. Fehler v. Gosnell, 99 Ky. 380, held, that a guaranty for five years to cover repairs was invalid. The assessment, however, was allowed to be levied to the extent of the actual cost of the first construction.

THE OHIO LAW ON SUPERVISION OF ACCOUNTS OF PUBLIC OFFICIALS.*

By Joseph T. Tracy, Bureau of Supervision and Inspection of Public Officers, Columbus, O.

The Act of May 12, 1902, creating the bureau of inspection and supervision of public offices, provided that the auditor of state, as chief inspector and supervisor, should appoint three deputies, not more than two of whom should be of the same political party, a clerk, and such a number of state examiners as were necessary to perform the duties imposed by the act. The department was organized July 1, 1902, and has been since that date engaged in attempting to do the most important of the many pressing duties continually arising in the inspection and supervision of the over 25,000 public offices of the state coming under its supervision. The work of the Ohio bureau, which includes all state, county, city, village, township and school district offices, may well be considered under the following heads:

(a) The prescribing and installing of uniform systems of accounts and records.

(b) The prescribing and collecting of uniform public reports.

(c) The preparation of comparative statistics from verified public reports.

(d) The annual inspection of all public offices.

(e) The supervision of all public offices.

*A paper before the National Association of Comptrollers and Accounting Officers.

We believe you will be interested in knowing what has been accomplished by the department in each of the above fields of public endeavor, so I will give you the results in as concise a form as the extent thereof will admit.

Uniform public accounts.—Uniform accounts have been prescribed and are generally in use in the auditing departments of the 88 counties, 70 cities, 720 villages, 2555 school districts and the 1347 townships of the state, resulting in a very marked improvement in the keeping of the public accounts. In consequence, the work of inspection is greatly facilitated and made more thorough. Under many of the old systems in use in the cities and counties of our state, it was wholly impossible to arrive at definite results from the accounts as kept, or to fix responsibility for errors or defalcations discovered. The improvement in the financial condition of the cities of Ohio is due in a large measure to the information given to the officials through the use of the accounting system prescribed by the department. In addition, forms of accounts have been prescribed for the sinking fund of cities and villages and may of the county offices. Also, various departmental accounts and records which were necessary to verify revenue collections have been installed.

Uniform reports.—Schedules for reporting by the auditing departments of counties, cities and villages have been prescribed by the bureau and the several officials instructed in their use. The accounting systems have been formulated so as to produce the necessary information from which to compile the reports and the department can have accurate and reliable returns on file in our office within thirty days after the close of the fiscal year.

Comparative Statistics.—Comparative statistics based upon the city reports of 1904, 1905 and 1906 have been issued by the department and proved of great interest to officials and citizens interested in municipal affairs. We have collected reports from the eighty-eight counties of the state, and are now engaged in the compilation of comparative statistics gathered from these reports.

Inspection of Public Offices.—This feature of our work has been so important to the public as to require practically all the time of the three supervisors during the past three years in aiding and instructing our examiners so as to secure reliable and uniform audits throughout the state. The aggregate amount of the findings returned by our examiners, consisting of illegal fees taxed, collected and retained by public officials, failure of collectors to fully account for revenues collected, and illegal payments from public treasuries, amount to over one million dollars, of which probably over one-half has been restored to the public funds. Under the present law the matter of restitution is left to local officials, who, in too many instances for the good of the public service, are in sympathy with the delinquent brethren and in consequence our findings are not vigorously enforced or are wholly set at naught. There will be an amendment presented to the next General Assembly which will give to the Attorney General of the state, full supervision of all legal actions arising by reason of findings returned by state examiners and requiring the approval by this department of all settlements made by local officials. We have 34 men engaged in making audits and the force is inadequate to even meet the demands of the public for inspection, much less to comply with the law requiring annual audits. If the public are to have faith in the thoroughness and impartial reliability of these examinations, it must come through its confidence in the honesty and ability of the man engaged in the field work. These should be men of clean personal habits, of absolute integrity, of ability as accountants and of extensive knowledge of the laws relating to public affairs. They must be tactful in their association with the officials undergoing investigation, else there will be unnecessary friction that will greatly retard the progress of their work. They must work hard that the true facts may be disclosed and then have the ability to express the results of their audit in a report, clear, concise and comprehensible in its statements. We hope to be able, after the next session of the legislature, to offer better remuneration to these faithful public servants. It has been impossible for us to secure an adequate force of well-trained men to comply fully with this portion of our work, so we have simply been attending to what we believe to be the most necessary part, and gradually extending our audits more and more into details as the installation of improved records and accounts permits.

Supervision of Public Offices.—While it is probably true that the work of the department is judged by the general public by the direct results as shown in the reports of our state examiners, yet I am quite sure that more real good to the public service has been accomplished indirectly through our work of supervision in perfecting the accounts, in securing uniform reports, in compiling reliable statistics, in advices to local officials, in construing indefinite laws, in recommending corrective legislation and in inaugurating reforms as to methods of conducting public business by the financial agents of the various political subdivisions of the state, than in the dollars restored to the public treasuries.

In conclusion, let me assure you that our work is only in its infancy and that the ultimate success of the movement for uniform public accounts and state supervision of public offices depends in a large measure upon an active, vigorous public sentiment that will demand a full compliance on the part of local officials with the rules and regulations promulgated by the state department. The only way to secure and retain the public confidence, which is the true foundation of all public sentiment, is to faithfully and impartially perform the duties of office. This we believe we have done and in consequence we feel assured we have public sentiment behind us in our work.

EDITORIAL COMMENT

Regulation of Stream Pollution and Water Purification.

The Government of the City of Washington.

Septic Tank Patents Sustained.

REGULATION OF STREAM POLLUTION AND WATER PURIFICATION.

At the convention of the Indiana Engineering Society held in Indianapolis January 16, 17, 18, the committee on stream pollution made a report suggesting some provisions for insertion in a law regulating stream pollution, most of them taken from the laws now in existence in other States, making a combination which should secure better results than are now usually attainable. The report also includes some of the provisions contained in a bill presented to the Indiana legislature at its last session, which did not receive consideration probably on account of other provisions which were too advanced to receive the approval of legislators generally.

The report first commends the Illinois law providing for a state water survey and recommends the addition of authority to study the waters of the State which are polluted beyond possibility of use as potable water and to test methods of purifying the liquids which pollute these streams, thus making a law which will include the best features of the Illinois and Massachusetts statutes.

It is then proposed to insert a provision similar to that in the Ohio statute prohibiting the discharge of sewage or drainage from public or private sources into any stream or the introduction of a water supply to be used for drinking or culinary purposes without the approval of the State Board of Health. Similar provisions are in operation in several States and, especially in Massachusetts, New York, Pennsylvania and Ohio. They operate successfully and are of great sanitary and engineering value. Changes in existing systems are to receive the same supervision of the State Board and they will gradually be brought under its control thereby.

The report opposes too strict a definition of pollution or the indiscriminate application of any definition. Economic considerations must enter into the solution of every engineering problem and too great a departure from them will prevent the passage of the bill containing the most scientific provisions if their application in any particular case will require the expenditure of considerable sums of money for the correction of conditions which are not causing injury to any one, however much they may depart from the scientific standard. Probably the strictly scientific definition of pollution included in the Indiana bill and the strict application of it to the streams required are the reasons for its prompt defeat. Even sanitary engineers who have labored long and faithfully for the cause of protection of streams from pollution considered the bill too strict and it is not strange that the legislative committee did not approve.

The committee report calls attention to one provision in the Indiana bill as a marked advance upon previous legislation. This is the reference of the decision regarding the removal of causes of complaint and the placing of the responsibility for the expense of any changes required to the courts of the State.

If complaints are made to the State Board of Health, seeking remedy for bad conditions, or if the State Board can investigate without complaints, it can determine what the conditions are, who is responsible for them, and who is injured by their continuance. Hearings can be held and frequently settlements can be made and conditions improved on order of the Board, but if the pocketbook of the average American is touched he demands his "day in court," and a provision putting the formal hearing and decision regarding the amount and the distribution of the cost of necessary improvements in the hands of the existing courts leaves the State Board of Health free to treat the scientific and sanitary sides of the problems and to present unbiased and independent evidence regarding both the theoretical and the practical points at issue when the case comes to trial.

It may possibly happen, for example, that a stream used for manufacturing or domestic purposes becomes

too seriously polluted for further use. It may be that in one case the polluters of the stream should purify their drainage, in another that the user of the water should purify it, or that both should do their share. If the State Board of Health has power to determine what the results shall be, the courts, with the aid of the Board and its experts, can very safely be intrusted with the decision of the questions of responsibility for the necessary changes and distribution of cost of construction and operation of the necessary works. The Indiana bill was perhaps not perfectly clear as to the division of the work between the State Board of Health and the courts but the principle upon which the provision is based appears to be correct. In the absence of experience, the details of a statute must be developed as the work goes on.

The question of prior rights would be subject to the decision of the court in each case instead of being settled arbitrarily by excepting existing works from the operation of the statute as is now the case to a marked degree in Massachusetts and in a general way in all the other States having laws of this sort.

THE GOVERNMENT OF THE CITY OF WASHINGTON.

After an investigation extending through more than a year's time Mr. James Bronson Reynolds, of New York City, acting as a special commissioner appointed by the President, has made a report covering in a general way the administration of the affairs of the District of Columbia. He has made some general recommendations which are briefly as follows:

1st: The substitution of a Governor for three Commissioners of equal authority.

2d: The extension of eligibility for the chief executive office, so that the President might have power to appoint as Governor a resident of the District or a non-resident who had served at least one term as Mayor of a city of not less than 50,000 inhabitants. The latter recommendation was borrowed from the system which has achieved such conspicuous success in Germany.

3d: The creation of distinct departments with properly salaried officers at their head in the place of Bureaus apportioned among the three Commissioners.

4th: The creation of a Municipal Council composed of the heads of the various departments, with public sessions. The present powers and duties of the Municipal Council are exercised by the three Commissioners, their sessions not public

5th: The creation of a Department of Housing and Labor.

The report also recommends the extension of the Civil Service to all minor District appointments.

The departments recommended are that of health, the extension of whose work is recommended; a department of police and fire in which will be included bureaus of transportation to control street traffic, of theaters and markets, and of identification; a department of buildings and public works, to supervise all public buildings, sewers, lighting and water supply and control the construction and safety of private buildings; a department of charities; an independent department of corrections including a Juvenile Court; a department of street engineering, to construct, repair and clean streets and sidewalks and remove and dispose of ashes and garbage; a department of housing and labor to include a bureau of statistics on social problems, a bureau of housing to control tenements, small houses and alleys, a bureau of labor to oversee loan shops, factories, shops, employment agencies and other appurtenances of the labor problem, and a bureau of insurance to induce savings through bank deposits, industrial insurance, etc.

One unacquainted with the author of the report is disposed to think that his training and experience have been with the charities, correction and labor problems of the large cities and that he has had no practical experience in the lines of public improvement in the more modern cities, certainly no such experience in cities whose public works are properly collected and classified under bureaus and departments in such way as to insure the highest efficiency, the least duplication of work and the least friction between bureaus. This may be inferred from the arrangement of the bureaus and departments above listed.

It is difficult to see why the department of street engineering should be separated from the department of public works, for example. Street, sewer and water main construction are so closely allied that they should be in the charge of bureaus under the same chief and in close touch with each other's work. The sewer and water problems in Washington are quite as important as that of streets and all should be put on the same level. These are all engineering problems which should be in the hands of engineers, while the planning and construction

of public buildings and supervision of private buildings are architectural problems and should be in the hands of architects. There seems to be no good reason, also, for taking the supervision of theaters and markets out of the building department and putting it into the police and fire department, except so far as policing is concerned.

That the study has been superficial and not under expert direction is shown also by the fact that such offices as coal inspector, inspector of weights and measures, sanitary inspector have not been placed in their proper departments but are left for future action.

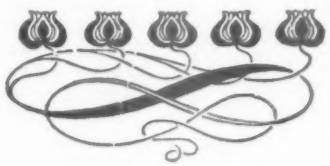
The recommendation of the adoption of the uniform systems of accounts and reports is excellent and if the author had at the same time accepted the recommendations made by the same organizations leading to more uniform systems of doing public business he would have prepared a report along lines laid down by men reasonably expert in the field he has tried to cover and could have produced a more satisfactory plan for the capital city.

SEPTIC TANK PATENTS SUSTAINED.

As shown by the abstract of the decision of the U. S. Circuit Court of Appeals elsewhere in this number of MUNICIPAL ENGINEERING, the Cameron patents upon process of purifying sewage are sustained while the patents on apparatus for operating the system are not sustained. This is the reverse of all former decisions in lower courts, both state and United States and of the opinions of engineers generally.

The writer has held the general opinion and has considered it to be strengthened by the fact that he planned a tank about 1890, which was constructed very shortly thereafter, which possesses nearly all the details of the modern septic tank and which was intended to operate in the same way, although there was no definite knowledge of the principles of septic action and comparatively frequent cleaning of the tank was expected. The plans for the sewage disposal plant referred to, as approved by the State Board of Health, provided for chemical precipitation, but the sewerage system was new and the funds were low, so the part of the disposal plant actually constructed was modified as to inlets and outlets and became practically what is now known as the septic tank. It has operated successfully ever since, as reported by the sewer commissioners, and the predicted frequency of cleanings has not been found, it being seldom necessary to remove the sediment from the bottom of the tank. The effluent from the tank is discharged through an outlet pipe several hundred feet in length and receives no aeration until it mingles with the waters of the rapidly flowing stream which it enters.

It does not seem possible that a patent issued some years after the construction of this tank could apply to it, or to others constructed in similar manner. But only the anaerobic bacteria are provided for in such a tank and the combination with such a tank of aeration and filtration upon the basis of the theory of the Cameron patents is far beyond the tank alone and patents on such a combination could not be affected by the prior construction and operation of this tank. It would seem to the engineer who is not a lawyer, that the explanation of the successful action of a previously existing piece of apparatus could hardly be patentable, although its combination with other pieces of apparatus to produce a still better result and the process on which this combination depends may very well be subject to patent.



THE QUESTION DEPARTMENT

Books on Bridge Construction.

I wish to inquire if you have any late up-to-date books on steel highway bridges, also books on cement construction work including highway bridges.

P. N. G., Luverne, Minn.

The following books give some excellent material on these subjects: Reid's "Concrete and Reinforced Concrete Construction" (net $5.00); Buel and Hill's "Reinforced Concrete" (net $5.00); Taylor and Thompson's "Concrete Plain and Reinforced" ($5.00); Waddell's "De Pontibus" (2.00); Skinners' "Types and Details of Bridge Construction" Part I, ($3.00.)

Use of Sand and Gravel in Concrete.

One of the subjects which I would like to see discussed is the question of sand and gravel in concrete. For the last couple of years I have been giving considerable study to the question of recombination of sand and gravel in order to give the strongest and densest concrete, also the amount of water to use in obtaining greatest density. I have learned much along this line. When I can come to definite conclusions I will be pleased to write you an article. In the meantime I wish to hear from others.

H. A. M., Morrill, Neb.

This is a subject of great interest, especially in the manufacture of water-tight concrete. The first requisite in this is the densest mixture attainable. This can be obtained by the proper combination of various sizes of sand and gravel and the addition of the correct proportion of cement. Mr. Fred J. Warren, when he developed the formula for his bitulithic pavement, made a study of the forms and sizes of the voids in broken stone of various uniform sizes and then, taking a given quantity of the broken stone of the largest size, he determined the amount of some smaller size which could be put into the measure without increasing the bulk of the stone, he then filled the voids in this mixture with a still smaller sized stone and so on until he found the amount of stone dust needed to reduce the voids to a minimum. He was able in the laboratory to reduce the proportion of voids left to be filled with cement to about 5 or 6 per cent and is able in practice to reduce it to 10 or 12 per cent. This study must be made of each different kind of stone, owing to differences in forms of the individual particles and in sizes thereof. A similar study may be made of gravel and the proportions of various sizes to be recombined to produce the densest mixture can be determined in the same way. The method of making the experiment is described in MUNICIPAL ENGINEERING, vol. XXV, p. 102.

MUNICIPAL ENGINEERING will be glad to publish descriptions of experiments or methods of making concrete with the aim of producing the strongest and densest product, by our correspondent and by others among its readers.

List of Foreign Cement Manufacturers.

Do you publish a list of foreign manufacturers of cement?

D. S. W., New York City.

The only list of foreign cement manufacturers published in America is that in the third edition of the Directory of American Cement Industries, which was published in 1904. The changes in the industry of manufacturing cement are so slow in other countries that the list will be found quite accurate. A full list of the German manufacturers of cement is published by Tonindustrie Zeitung, Berlin, Germany.

A Quick Setting Cement Wanted.

We have recently received complaints from customers regarding the slow set of cement used by them for sidewalks. As there are a limited number of brands which can be used for this work we wish to know if there is any chemical which can be mixed with the cements, without injurious results, to expedite the set. Often a contractor has been caught with a frost in a newly laid sidewalk or wall and the whole job is ruined. If there is something to prevent this we would like to have the information.

P. L. CHERRY CO., Portland, Ore.

Whether the difficulty is with the cement, the amount of water used or the method of finishing used cannot be determined from the information

given. If the former, a request to the manufacturer for quicker setting cement will doubtless bring it. In the modern process of making cement, sulphate of lime is added to control the time and method of setting and the proportion can be varied to suit the requirements. If the cement sets too quickly the resulting product is not so good. Cement work should not be done in freezing weather, but when this is absolutely necessary the materials may be heated or the work protected so that the cement will set before it freezes.

Sharp Horse-Shoe Calks on Asphalt Pavements.

Will you kindly inform me through MUNICIPAL ENGINEERING whether the use of horse shoes known as the "Never Slip Shoe" is prohibited on asphalt paving and do you consider them injurious to any kind of paving?
SUBSCRIBER, Great Falls, Mont.

The writer knows of no place where they are prohibited. In fact it would hardly be fair to prohibit any reasonable form of calks. They are necessary when pavements are slippery and when almost any kind of hard pavement is put down it is expected that it will be more slippery than its predecessor and must therefore require sharper shoes for foothold of horses when the pavement is in particularly slippery condition. If the city follows the custom of foreign cities and sands its pavements when they are slippery from moisture, or ice, it may have some reason for prohibiting the sharp calks, but American cities have not formed this habit and can scarcely refuse to accept in its stead the necessary sharp shoes and the consequent greater wear of the pavements.

A New Surface for Asphalt Block Pavement.

This city is paved in principal streets with compressed (asphalt) blocks laid flat on sand bed of 2 inches and sand on prepared concrete 8 inches. Blocks are 3x5x12 inches and weigh 17 lbs. These wear at spots, and we think that the spot could be picked rough and a soft asphalt laid and pressed hot.

We would like the opinion of some firm expert in the matter, and to know what machine is best, price, etc. Here there is good stone, and stone breaker so it would be easy to make a trade.

Later it may be possible to get them to try a pavement that will last longer. The blocks squash so that all appears one piece. Are nice in appearance, but don't last. Blocks don't come out, but wear away apparently. At sides of rails and at corners of streets don't last two years. Stuff seems too soft—or not sufficiently pressed. Struck at corners of blocks it squashes a little like lead.
J. J. CLARKE, Lima, Peru.

It is assumed from the description that the blocks are of asphalt. Probably the asphalt used was too soft or too much asphalt was used. Both these are defects resulting in soft blocks, as well as the lack of sufficient compression. It should be possible to roughen the surface, clean it, perhaps heat it artificially if the sun's heat is not sufficient, and put on top of it and incorporate with it a layer of sheet asphalt or bitulithic pavement. The exact method of doing the work will depend upon the local conditions, and it is suggested that our readers send in statements of what they would do. The names of several asphalt and bitulithic contractors and of suppliers of materials and tools for doing the work will be found in the "Business Directory" published in each number of MUNICIPAL ENGINEERING under the headings "Asphalt," "Asphalt Floors," "Asphalt Machinery," "Asphalt Pavements," "Asphalt Plants," "Asphalt Tools," "Bitulithic Pavements," "Paving Contractors," "Road Rollers," etc.

Hydraulic and Portland Cements.

In the specifications for using paving brick, the National Paving Brick Manufacturers' Association makes a distinction between hydraulic cement (1 part of cement, 2 parts of sand) and Portland cement (1 part of cement, 3 parts of sand). Kindly explain the difference between hydraulic and Portland cement and greatly oblige.
G. W. H., Lebanon, Pa.

Strictly speaking both the classes of cement mentioned are hydraulic cements, the term distinguishing them from other cements which do not set under water or do not require water for their setting. MUNICIPAL ENGINEERING and the "Directory of American Cement Industries" have adopted the term "natural hydraulic cement" for the first class of cements mentioned in the question, the word "natural" indicating that they are made by burning the natural rock without mixing, and the word "hydraulic" distinguishes its action with water. Portland cements are primarily those which are made from artificial mixtures of raw materials, but as there are occasionally cements made from natural rocks which are equally good, the term Portland cement now applies to hydraulic cements of certain chemical compositions. All Portland cements are hydraulic, but not all hydraulic cements are Portland.

Waterproofing Concrete Blocks.

Has any successful material or compound, not patented, easily and cheaply obtained, been found for waterproofing the face of concrete building blocks? Please give a discussion of this subject at an early date.

B. S. R., Guthrie, Okla.

Our correspondent is referred to the firms listed in the "Business Directory" published in each number of MUNICIPAL ENGINEERING under the heading "Waterproofing" some of whom have what he desires. The demand for waterproof outside surfaces has arisen since the cement block has come into the market, because so many makers of blocks use too little cement or use poor mixtures of materials and do not make their blocks wet enough. The first thing to do is to eliminate these defects and then any little residual lack of water tightness can be taken care of with paraffine or Japanese wax or chloride of calcium or Sylvester's process or some other one on the market. Most of them have been described in the "Handbook for Cement Users" ($3) and in the volumes of MUNICIPAL ENGINEERING beginning with 1905. Other articles on the subject appear in this and following numbers and our readers are invited to share their experiences with others by contributing them to the department "From Workers in the Field." Among the articles in recent numbers are the following: "Methods of Waterproofing Building Materials," vol. xxxiv, p. 32; "Medusa Waterproofing" vol. xxxiii, pp. 53, 57, 207; vol. xxxii, p. 272; vol. xxxi, p. 65; "Impervious Concrete," vol. xxiii, p. 253; lists of makers of waterproofing compounds, some of which are satisfactory, will be found in vol. xxxii, p. 89; "The Use of Waterproofing in Concrete," vol. xxxii, p. 164; "Waterproofing for Block Walls," vol. xxxii, p. 665; "Waterproof Concrete," vol. xxxii, p. 343; "Waterproofing Cement Blocks," vol. xxxii, p. 393; "Maumee Waterproofing Compound," vol. xxxii, p. 411; "Methods of Testing Cement for Waterproofing Properties," vol. xxxi, p. 312.

A Satisfactory Cement Block House.

I have a cement block house, constructed over a year ago. I can say that I am well pleased with the same. The difference in the fuel bill alone will many times pay the interest on the difference in cost. I have a roofing of asbestos shingles, that gives me full satisfaction. If cement could be had for a reasonable price, compared with the cost of production, it would be the cheapest building material and the best in the market.
H. C. HOWARD, M. D., Champaign, Ill.

The above gives a layman's opinion on cement block construction and is of special interest on this account.

Plans for City Fire Engine House.

Can you refer me to any publication, or person from which I can obtain plans for a city fire house?
W. H. R., Columbus, Ind.

Possibly Palliser's "Court Houses, City Halls, etc." ($2) contains plans which will meet the need. Can our readers refer us to others?

Trench Digging.

What is the standard of working or digging different kinds of soil in constructing or laying sewer or water pipes; how to figure certain depths when using stages; time set for ten hours work and one man? Is there a journal in the market on sewer and water main construction?
J. S., South Milwaukee, Wis.

The following articles in MUNICIPAL ENGINEERING will give information on the points mentioned:

"Cost of Laying Vitrified Pipe Sewers at Various Depths," vol. xviii, p. 110, giving the average days work as 11 cubic yards and in soil requiring no sheeting.

A diagram giving cost of excavating sewer trenches is given in vol. xxi, p. 407 in an article on "Estimation of the Cost of Sewer Construction."

"Cost of Sheeting Sewer Trenches," vol. xxiv, p. 195, where the cost of sheeting in trenches in sand is said to vary from 21 cents per linear foot less than 8 feet deep to 76 cents in trenches 14 to 16 feet deep.

Folwell's "Sewerage" ($3) also gives some information.

Some idea of standards can be obtained from these sources but the amount of work to be expected depends upon the location of the work, the nationality of the laborers, the conditions of the labor market, as well as the condition of the soil, so that no figures can be given, except as averaged in these articles. The depths of stages for sheeting depend somewhat on the character of the soil but are usually say 6 to 8 feet. Depths of stages for shoveling out dirt would be somewhat less, say four or five feet although greater lifts are sometimes used.

MUNICIPAL ENGINEERING probably contains the most information on the subject of sewer and water main construction of any journal published,

the above list of articles containing those which answer the specific questions asked, only.

Concrete Tunnel Linings.

Please give us some information as to concrete lining of tunnels, particularly as to equipment for same. Do you know anything about a compressed air method of handling concrete and placing same in arches of tunnels?

D. T., Hazel Patch, Ky.

Taylor and Thompson's "Concrete Plain and Reinforced" ($5) and Buel and Hill's "Reinforced Concrete ($5) give brief descriptions of methods of construction of linings of several tunnels under varying conditions. One of these is the East Boston tunnel which was built with the aid of compressed air. A full description by Howard A. Carson of the construction of this tunnel will be found in the Journal of the Association of Engineering Societies for December, 1902. (30 cents).

What is Bank Gravel?

Can you give me any information as to what is known as "bank gravel"? The only definition I have, as yet been able to find is in McCullough's "Engineering Work in Towns and Small Cities," where it is defined as "such material as is obtained from a pit or river containing both sand and gravel."

My reason for wishing to know is that the word "bank gravel" appears in a set of specifications for artificial stone sidewalks prepared by the former city engineer, and acting on McCullough's definition I allowed river gravel containing sand to be used in the construction of some sidewalks.

Some of the property owners have refused to pay for the sidewalks in front of their property, contending that the work was not done according to the specifications, one of the contentions being that the material used was not "bank gravel" because it came out of the river.

I hold that the material used was a proper one even were it not "bank gravel," although I shall contend that it is such gravel until it is proven otherwise.

R. W. BALL, City Engineer,
Henderson, Ky.

The term "bank gravel" usually applies to gravel deposited by glacier or stream in earlier times, which is now found in banks or bluffs, as distinguished from creek or river gravel, which has been deposited more recently in the bed of the stream or on the area subject to overflow by the stream. Either because of its greater age or because of the difficulty of getting the gravel out free from the soil on top of it, bank gravel is likely to have more dirt than creek gravel, but this is not always true. Because of its recent deposit creek gravel may have some organic matter, bits of wood, etc., which have decayed and become finely divided soil in bank gravel. Both kinds of gravel vary in composition from coarse gravel to fine sand and all sorts of mixtures of sizes, according to the method of deposit.

In any local specification the term bank gravel probably means a quality determinable within rather wide limits for that locality, but if the supply of gravel is not ample it should certainly be possible to supply a gravel equally as good as that intended by the specification even if not technically bank gravel. The term bank gravel is undoubtedly indefinite as a standard of quality and a better specification could be written. Since the term has been used it would seem that the proper procedure would be to ascertain as nearly as possible what the quality of gravel specified by the term actually is, and then to permit the use of any gravel which is equally as good or better. The courts would doubtless sustain such a procedure in the absence of evidence of fraud.

In some localities there may have been such great differences in the sources of the bank and creek gravels and in their methods of deposition that there is a marked distinction between them and possibly, but not probably, one could not be used instead of the other.

Pit gravel is another term applied to bank gravel, especially if taken from an excavation below the surface of the ground on all sides rather than by digging into a bank.

Bank, pit and creek or river gravel are gravel in the natural state. All of them may be washed, and under modern methods of removing gravel from rivers the river gravel is usually washed in the process of removing and may also be separated into any desired sizes or mixtures of sizes.

Details of Concrete Work.

I have been looking for something that gives details of sewers, culverts and small bridges and the beautifying of the village or town. I would also like to get detailed information about cast concrete for ornamental work, such as vases and small fountains.

T. H. N., Lyndonville, N. Y.

A subscription to MUNICIPAL ENGINEERING will give as much on these subjects as any other available source of information. The "Handbook for Cement Users" ($3) is also of much

value in these lines. There are one or two American books on the details of casting stone and handling concrete such as Bakers' "Cement Workers' Handbook" (50 cents), but the source of most of our information is Germany. The cement workers' trades in foreign countries preserve their secrets very carefully and it is also practically impossible to impart them in books. Only the general principles can be so presented and the special knowledge necessary to produce uniformly good work under expert direction or after long experimentation under varying conditions. Americans are now making some progress in discovering and receiving instruction in these special "tricks of the trade" and the external appearance of concrete work is improving as a consequence. Most of this work has a more scientific basis than that of the German workmen and instruction in its details can be imparted more readily, but there is much to be learned before the best results can be obtained and their uniformity guaranteed.

Information About Cost of Making Concrete.

J'ai l' honneur de solliciter de votre bonte et de votre obligeance les renseignements detailles sur l' installation de la fabrique de ciments, qui fait l' objet d' un traite dans votre journal No. 6, volume 26, et reproduit sommairement par diverses revues scientifiques; Mois Scientifique et Industriel, Thonindustrie-Zeitung, etc.

Cet expose porte sur les frais l' installation d' une usine a ciments travaillant ave six fours tournonts et donnant un rendement journalier de 2,000 barils.

Je vous serais tres reconnaissant de vouloir bien me faire parvenir dans le plus bref delai possible les numeros de votre journal concernant cette fabrique.

A. BURRIAT, Grenoble, France.

The following articles regarding the cost of manufacturing cement and the cost of building cement plants have appeared in MUNICIPAL ENGINEERING:

"The Cost of Making Portland Cement," vol. xx, p. 241.

"Cost of Making Cement," vol. xxii, p. 229, a note giving estimates of total cost.

Mr. Edwin C. Eckel wrote a series of articles for MUNICIPAL ENGINEERING upon Portland, natural and puzzolan cements, going into the details of composition, manufacture and cost. These articles will be found in vol. xxiv, p. 335, vol. xxv, pp. 1, 75, 147, 227, 405, vol. xxvi, pp. 6, 227, vol. xxvii, pp. 168, 422, vol. xxviii, pp. 208, 290. Nearly all of these give figures concerning the cost of certain parts of the processes.

Boilleau and Lyon have published articles on the cost of building and operating cement plants which will be found in vol. xxvi, pp. 321, 391, vol. xxviii, p. 366, vol. xxvii, p. 250.

See also the article giving the list of the machinery in a modern cement plant in vol. xxvii, p. 30, and an article on quarrying and crushing stone, not particularly applied to a cement plant, in vol. xxvii, p. 360.

Information About Good Roads.

Can you inform me whether Indiana has a Good Roads Commission or where can I get brief articles on dirt and hard roads? I know the government sends over the country road engineers who give demonstrations on improved roads. I would like to know under what department they are employed as I have never seen anything in civil service examinations to fill such places.

J. A. C., Petersburg, Ind.

Indiana does not have a Good Roads Commission. The roads of that state are constructed by the counties or the townships and there is no central authority on the subject. The U. S. Department of Agriculture has a Bureau of Roads Inquiry which is collecting information regarding all matters affecting the road question and occasionally has given demonstrations of methods of road construction. This is a kind of expert work which may not be subject to civil service examinations, at any rate the number of places to fill is very small as the appropriations for this kind of work have been very small. Application to the Bureau of Roads Inquiry at Washington, D. C., will probably secure admission to its mailing list so that the publications of the office can be received as soon as issued.

Flood Storage Reservoirs for New Jersey.

In a letter to Governor Stokes, of New Jersey, January 14, 1908, James A. Garfield, Secretary of the Interior, assured him that the Federal Government was ready to co-operate with New Jersey in the building of storage reservoirs to prevent floods in the Passaic Valley. The government will give the services of its engineers and experts in the preparation of plans.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.

Tests of Brick Pavements in Chicago.

There have been several statements made that Chicago was making a comparative test of bricks in pavement, but up to this time no definite information concerning them has been available. In a letter to Mr. J. W. Howard, the superintendent of streets in Chicago, says that "some years ago several different kinds of brick were laid in a driveway leading to the coal room of the Chicago avenue pumping station, but no traffic census has been taken and no results of value obtained." It is to be hoped that some one will take interest enough in the matter to take a traffic census or at least to estimate the amount of coal hauled over the pavement to the coal storage bins and then to carry the test to its logical conclusion. Since the abandonment of the Detroit test, partial report on which was made in MUNICIPAL ENGINEERING some years ago, the Chicago pavement is the only one on which it is now possible to make a comparison of various kinds of brick under wear, or of the rattler test with actual wear.

The Conditions in the Panama Canal Zone.

In a personal letter to the editor of MUNICIPAL ENGINEERING, Mr. Caleb Mills Saville, consulting engineer on the Panama Canal, gives some interesting information. He was prepared to find the conditions unpleasant, but as time passes he is more convinced that in the main, conditions are excellent. Some things, such as quality of foods, for example, might be improved without much trouble if competent persons were given power to bring about the improvement, and there is a constant striving to remedy the evils which exist.

The army officers in charge receive their civilian assistants cordially and the relations between them are entirely satisfactory. They have shown themselves to be able engineers and offer every facility for good work by their subordinates.

Health conditions are excellent and Mr. Saville thinks the climate is very comfortable and that there is no reason why one who is abstemious and careful should not enjoy as good health as elsewhere.

The canal is not a place of "soft snaps." The principal engineers are working hard and it is expected that subordinates will do likewise. Generally this is so and to a remarkable degree the organization is as a man working for one thing, the success of the work.

Mr. Saville is in charge of the experimental work in connection with the foundations and materials for the big dams and our readers may hear later regarding the results of his work.

Surveys for Irrigation Purposes.

The Denver Reservoir Irrigation Company is a company organized under the laws of Colorado for the purpose of building a dam about fifteen miles northwest of Denver, Colorado. The water stored in this lake, to be known as Standley Lake, is to be used for irrigation and power purposes. It will make a lake two and one-half miles long and one and one-half miles wide and contain 100,000 acre-feet of water.

The dam itself will be about one and one-half miles long, 145 feet high near the center, 750 feet wide in the widest portion on the bottom and 30 feet on top.

At the present time the engineers are engaged in surveying four townships, or 144 square miles, in a northeasterly direction from the dam site. The slope of the land from the dam site follows a northeasterly course along the west side of the South Platte river. The dam site is in Sec. 21, T. 2 S. R. 69 W., while the land bought

by this company is in T. 1 S. and T. 1 N. R. 63 W. and T. 1 S. and T. 1 N. R. 67 W.

As the company owns much of the land in these four townships they are making a complete survey of all of them in order to know just where lakes and ditches can best be located.

There are three parties in the field, the stadia party, base line and level party, and the bench mark party. Each party is in charge of an assistant engineer.

The bench mark party started from a U. S. G. S. elevation from which the elevation for the dam was taken. This elevation is carried along the highways and section lines putting permanent elevations on houses and bridges and on hubs at each section corner, there being no trees large enough in the country. The fence posts at the section corners were marked with the section, town, and range. The allowable error in these elevations was .025 to the mile.

The base line party started from a known section corner and ran a base line around each section, followed by the level party. Then each section is divided into three parts by two base lines running either north and south or east and west. These lines are as nearly as possible one-third and two-thirds the distance across the section. Owing to the gulleys and buttes in these sections these interior lines are rather puzzling to locate. The section being divided into three parts the stadia party is enabled to follow up and take shots of 700 or 800 feet on either side of the base lines. From these notes the office force plats all lines, puts in contours, and makes a map that will enable any one to locate a "paper" ditch with reference to the water to be obtained from the big Standley Lake.

There are several smaller lakes, over this area being surveyed. A base line is run around the lakes and from this, stadia shots are taken where needed to get the contours of the bottom of the lakes and later, figure the acre-feet of water in them.

This survey will take all the winter and part of the spring.

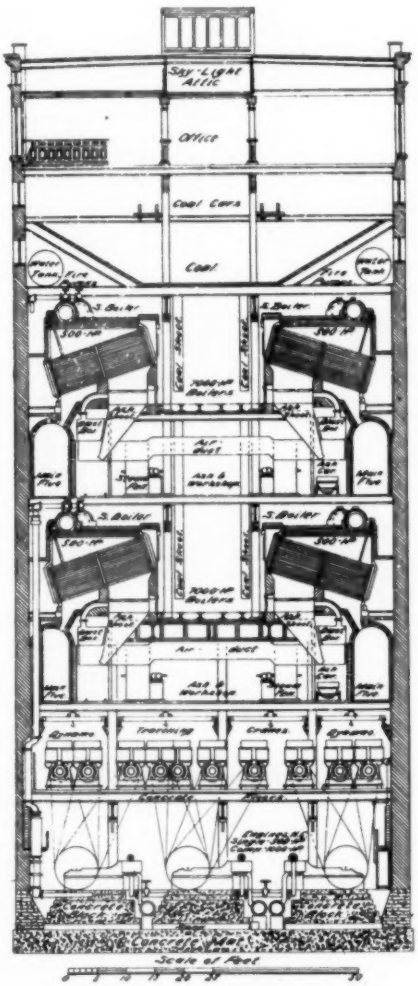
S. H. McMULLEN, Denver, Colo.

The First Ten Thousand Horse-Power Electric Station in the World.

The figure in this paper gives a vertical cross-section of the first 10,000 h. p. modern electric station ever designed and erected.

As the pleasure of accomplishment was sufficient for me in 1887, and as the field ahead of me was an unknown field at that time I have never had time to publish the drawings of the Philadelphia Edison Electric Light Company's station.

It will be noted that this station rested on a concrete mat 100 feet long



THE FIRST 10000 HORSE-POWER ELECTRIC STATION.

and 70 feet wide which varied in thickness from 4 to 100 feet. The foundations of the Armington and Sims engines were concrete monoliths placed on a bod of sand about one foot in thickness.

The dynamos of 1,000 amperes capacity and 140 volts were the first ever made of this size by the Edison Gen-

eral Company, and were designed by John Kruesi. As will be seen, they were bolted two in series to the engine below.

It is interesting, too, in view of the immense advertisement of concrete engineering now-a-days, to note the fact that all the floors of this station were made with single brick arches and concrete, the iron beams supporting them being calculated for rigidity and having an immense surplus strength. These floors were calculated to carry 4,000,000 pounds each. The outside walls of this station were carried up in brick for four stories and afterward, for the remainder of their height, in steel beam frame-work filled in with brick; while the roof was asphalted.

The coal pocket and the coal chute are probably the first instance in which this method of storing coal was adopted. The coal itself was lifted by means of electric elevators, to the coal pocket or bin, and it was found cheaper to lift the coal 100 feet by power in coal barrows than to trundle it 10 feet horizontally by man power.

The ashes from the ash-bins were taken out on the same elevators that raised the coal. The coal was weighed into pits from hopper wagons and run out of these pits by means of a molasses gate valve into the barrows, while the ashes going down the same elevator shaft were stopped above the coal scales, run out on a drawbridge and dumped into the wagons, and incidentally weighed out just as the coal was weighed in.

The steam from the boilers on the fourth and sixth floors was carried down to the engines by eight 10-inch pipes, two on each side of the building and two at each end of the building.

As the city of Philadelphia demanded $20,000 a year for water as its minimum price, it was decided to sink a well and use our own water, which was done. In order to avoid incrustation of lime, one grain of caustic soda was added for each pound of water evaporated and sufficient cutch was dissolved and run into the well to give the water a slight reddish tinge. As a consequence, the sulphate of lime was replaced by sulphate of soda and the lime precipitated by the tannic acid of the cutch as a slush, which was easily blown out of the mud drums, and the $20,000 a year was saved.

It is interesting to note that the general arrangement of electric stations, designs for which are published frequently in our journals, do not practically differ from this designed twenty years ago, save in the fact that engines and dynamos are direct-connected and that usually much less concentration of power on a given area is obtained, for in the Philadelphia-Edison station there was the capacity for 1 h. p. on each 2-3 of a square foot.

The building had a circular tower on each corner, two of which were utilized as chimneys at the rear. The two in front were intended, one for a spiral staircase and the other for an elevator to the offices at the top of the building.

I will not elaborate on the structure and design, but call your attention to the difficulties of operation which at the time of starting in 1899 were very great because the field was practically unknown.

The distribution of the current by means of underground Edison 3-wire system was not practically understood at that time and an attempt was made to proportion the 3-wire mains to the supposed requirements of each block, but after a thorough consideration, the large number of small mains which had been shipped were returned and, I think for the first time, the principle adopted of using mains as equalizers.

For all lean districts I laid down mains of 250,000 circular mils and for all heavy districts the mains were 500,000 circular mils. The feeders from the station were carried out to the junction boxes and the feeder resistances were cut out, leaving the mains to equalize themselves, and I may almost say, the feeders, too.

The services, which at first were of Edison or Kruesi tube make, were finally made of lead-covered cable with 3 wires with a quarter of an inch or more insulation around each wire. After the first few months there never was any trouble worth mentioning with the mains or with the services, although we occasionally had a feeder in difficulties.

To keep track of all the data in this entirely new field, a log book about 4 ft. x 4 ft. was carefully designed and all the data regarding coal, water, voltage, amperage, etc., were recorded each hour, two log keepers in a special office being assigned to this duty. They were the most profitable investment that the station ever made in the way of bookkeeping, for we knew from day to day the exact quantities of all the raw materials used and of the output of the station.

Aside from my ability to review the costs of everything, this log book was a constant check on any variations or losses, notifying the manager at once of them.

After the station was started, the difficulties of obtaining a load had to be faced. The price for the light, which was then sold by the 16-candle lamp-hour, was one of the greatest difficulties, because up to that time no one could learn the commercial and practical cost of current and lamps from what had gone before.

Up to 1892 the Company had had four Presidents in quick succession. Each one of them, after trying for a while to solve the problems and to fix prices, gave it up, but all of them agreed upon one thing, and that was, that the price must be higher than that of gas, which was then $1.50 per thousand in Philadelphia. By the beginning of 1891 a number of experiments had been made by them, each and every one proving a failure. At that time, Mr. Edison advocated putting the price of electric lighting at ¾ of a cent per lamp, or just the same as gas at $1.50. In the meantime, however, the financial matters had been going from bad to worse. The Board of Directors had accumulated a bonded indebtedness of $300,000 and a floating indebetedness of about $180,000 in addition. Everybody in the Board, in the year 1891, felt that they were staring failure in the face.

In the meantime the writer had been diligently learning the actual cost of producing a lamp-hour, using the log book and such figures as he could obtain. He was convinced that Edison was right in placing the maximum price of electricity at 15 cents per kilowatt, and prosecuting his investigations further, with the aid of this same log book he soon learned that if any one used lamps or motors for long hours that it would be profitable to reduce the prices even further, so that if any one would use the current for 10 hours there would be 15 per cent. profit on cash outlay with the current at 5 cents per kilowatt hour, and if any one would use the current for 5 hours in a day, there would be the same profit with the current price at 7½ cents per kilowatt hour. These facts and figures were not theory, they were the result of much wasting of the midnight oil, after his day's work as engineer was done, in considering the true cost of producing the electric light.

When in 1892 he was made President (in the hour of utter discouragement of every one except himself), he found himself free to do much as he pleased because the Directors, feeling doomed to failure, thought it might as well come quickly as be delayed under the existing regime. The results, however, were entirely different from what they had expected because during the four following years the stockholders received 53 per cent. in dividends in actual cash and the debentures for $300,000 and the $180,000 floating indebtedness were also paid off.

WILLIAM D. MARKS, PH. B., C. E.,
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PUBLIC IMPROVEMENTS

Ohio Park Commission Bill—Supervision of Public Accounts—San Francisco's Former Mayor—Cleveland Building Code—Patented Pavements in Wisconsin—Municipal Street Repair—New York Water Power—London Water Supply—New Jersey Land Reclamation—Water Conservation in New Jersey—Pennsylvania Water and Sewerage Control—Sewage Purification Patents Sustained.

A Park Commission Bill Proposed in Ohio.

A park commission bill was considered and approved, at a meeting of park commissioners recently held at Columbus, Ohio, whereby any city in the state may have a park commission should the people, by a vote, express a wish for one. The duties of the commission will be to lay out parks, boulevards and playgrounds, purchase grounds, levy taxes and dispose of bonds; but a vote will again be necessary to permit of the issue of such bonds. It will become the sole duty of five men in each city to give special attention to this long neglected but important question, and to study the

problem of parks and play-grounds both for the present and future and prepare plans for new systems, additions and improvements. By having such a bill carefully prepared and as carefully considered by the legislature, wherein all rights are properly conserved and safeguarded, it would be impossible to take up park and playground propositions in any city without the prospect of intermeddling by incompetent city councils, the matter resting solely upon the vote of the people, before whom the merits of the question could be satisfactorily placed.

State Supervision of Public Accounts Recommended for South Carolina.

The grand jury, at Beaufort, S. C., suggests the appointment of a state accountant to examine the books of all county officials. In its presentment the grand jury says:

We respectfully submit that it is impossible for the grand jury with the time and means at its disposal to properly examine the books, accounts and methods in the offices of the county officials. We can only skim over the surface and the grossest frauds might easily be perpetrated and overlooked by us in the necessarily superficial examination that we make. This is a fact that is apparent and needs no argument. In our opinion these offices should be examined at least once a year by an expert accountant who should be a State official appointed by the governor. While we have no reason to believe such an examination would uncover wrongdoing in this county, we submit that the system is wrong and urge the legislature to apply the suggested remedy.

San Francisco's Former Mayor Acquitted.

The district court of appeals, at San Francisco, Cal., handed down an opinion, January 9, reversing the case of former mayor Eugene E. Schmitz, who was found guilty of extortion in the French restaurant case. The decision practically finds that no crime was committed by Schmitz, even though he may have taken money collected by Abraham Ruef, a former political leader, who turned State's evidence against Schmitz.

Cleveland's Building Code.

The building code of the city of Cleveland, revised edition of 1907, has just been issued in a paper bound volume of 316 pages. The code is included in two ordinances, the first covering the administrative features, including the organization and administration of the department of buildnigs, duties of inspectors, regulation of permits, and fees. The second ordinance goes into the detail of construction of buildings, occupancy of public property, fire protection and elevators. Title X is devoted to concrete construction and covers nearly eight pages. The Cleveland code has often been referred to as a model in form and has been followed frequently in content and this revised edition is therefore of special interest. More detailed consideration of its engineering features will be given later.

Patented Pavements in Wisconsin.

In the case of Hobart N. Stocking et al, vs. Warren Bros. Company, the question whether a contract must always go to the lowest bidder was decided. Hobart N. Stocking, a taxpayer, enjoined the city of Superior, Wis., from letting a contract to Warren Brothers for paving with bituminous material, a patented process. The objection raised was that under the city charter a contract had to be let to the lowest bidder, and by letting it to a bidder for a patented pavement, this provision of the charter was violated. The supreme court had passed upon this point before, but the company had never raised the point that it was protected in its rights by a United States patent. Warren Brothers appealed and the decision was affirmed.

New York Should Retain Control of Its Water Power.

In a supplementary opinion written by Commissioner Osborne he concurs with the other members of the Public Service Commission in the second district approving the application of the Hudson River Electric Power Company to issue $3,232,000 additional bonds to develop water power rights on the Sacandaga River. He deals more particularly, however, with the question of general development of the water power resources of the state and precautions to be observed by the Public Service Commission in granting water power privileges to private corporations. Commissioner Osborne sets forth the duty of the commission to protect the state should it decide to develop its water resources. He holds that the commission should not by its acts enable a private owner to gain vested rights in a water power which will force the state later on to pay more for the control of that water power than the amount actually ex-

pended by the private owner in acquiring and improving the property.

He says that it devolves on the Public Service Commission to see that nothing be done which will not leave the state the utmost freedom of action in dealing with the development of these water powers. Quoting section 55 of the Public Service Commission's law forbidding the capitalization of franchises, he says:

These provisions, as well as the whole trend of the law, show clearly that the legislature did not intend to allow certain powers granted by state or municipality to inure to the benefit of private individuals in the case of public utilities; and while the legislature has not by any means so clearly or fully declared itself in the policy concerning the water courses of the state, it has indicated a possible policy to be pursued by the state, in which the same principles which underlie its present attitude toward its public utilities may posibly be assumed in the future toward its water powers, which, as the Governor has pointed out, may be developed and utilized by the state to great public advantage.

Municipal Street Repair Departments.

Mr. Clarence A. Kenyon, a prominent paving contractor in Indianapolis, St. Louis and other western cities is a convert to the municipal street repair plant. In a recent interview, published in the Indianapolis News he says:

The Indianapolis charter provides that the cost of public improvements be paid by the abutting and adjacent property as benefited, but the cost of repairs, the law says, shall be paid by general taxation. A considerable part of the cost of repairs is now paid by the abutting owner by including in the construction contract a clause requiring the contractor to maintain a pavement for nine years. It may be argued that this is a guarantee that the pavement will last that long, but the contract says that he shall "repair" the same, and, besides, most people know that few pavements, if any, last nine years without repairs. This, then, is tne burden the abutter is required to bear, and yet in law and right, he should not bear. If these long guarantees were reduced to a minimum of one year and one-half, as such contracts are made in Europe, and a repair department properly organized as a part of the city government, the cost of public work would be less and the repair work more efficiently performed. The public uses and wears out the pavements that the abutting property owner has paid for; it would, therefore, seem to be the duty of the public to properly repair and conserve these improvements.

An asphalt repair plant is not only expensive to construct, but it requires expert and experienced men to operate it and care for it, and even then it is in constant need of repair. To manufacture and lay the asphalt wearing surface successfully requires not only one, but many experienced men. These men can not be picked up every time the city desires to make a little repair. In order to have the work efficiently done, it is necessary to keep these men the year around.

It seems to me that now is as good a time as any for the city to organize a permanent repair department; this might be profitably united with the street cleaning department, and all might possibly be put under the street superintendent. But it should be organized after the plan of the police department and fire department and the men put under civil service regulations. Proper equipment and a municipal yard should be owned by the city. Expert men could then be obtained and trained to make repairs, not only to asphalt pavements, but to all other pavements, sidewalks, curbing and sewers, immediately, as the necessity requires. When the weather is not propitious for repairing asphalt pavements, they could repair brick, wood block, etc.

There is abundant work in this city to keep such a department at work all the time, and there is no work that requires skilled and unskilled labor any more than this work. As it is now, the old, lame, decrepit and unskilled are given jobs under the city, and, of course, they are unable to do more than half a day's work, and then it is poorly done.

The public should not be deceived by the suggestion that the city engineer, or his assistants, can instruct the men how to lay asphalt pavement. The city engineers do not know how to do it. It is not taught in the engineering schools, and they have had no experience along those lines; they are not to blame. To lay an asphalt pavement, or repair patches, a trained, scientific man with knowledge how to use and treat the various asphalts, oils and sand that enter into its composition, and how to compound and make and lay the pavement, is a complicated matter if it is done properly and if it is not done properly, it might as well not be done at all. Therefore, I say, that it seems to me that it can only be done efficiently, under a properly organized department. This department could be started modestly at first, and then gradually worked up to the highest efficiency.

In Europe the cry in all their municipalities, is conserve, conserve; most of them have departments of the kind here suggested and they are most efficient. In fact, one engineer told me that such a department properly conducted nearly doubled the life of street improvements.

Proposed Extensions of London Water Supply.

Parliament will be asked for permission, by London's water board, to build an artificial reservoir in Bourne valley, 10 square miles in area, at a cost of $8,250,000. This will increase the daily supply of water from the Thames, it is estimated, from 129,000,000 to 450,000,000 gallons, which, it is claimed, will provide for all of London's needs until 1960, when the population is expected to reach 16,000,000.

It is conceded that after London's population reaches 16,000,000 the Thames supply will be inadequate, and Parliament may object to the above plan as a makeshift, and may demand that London go to Wales for its water supply at once. The water board is seeking, even now, power to acquire a watershed in Wales large enough to insure an adequate supply after 1960. The Thames water is more or less polluted, but the board's experts promise perfect purity by filtration methods.

New Jersey Land Reclamation Association.

The New Jersey State Land Reclamation and Drainage Association was formally organized at Trenton, N. J., December 30, for the purpose of bringing about a reclamation of land in the state that is now worthless, and making it valuable. County, municipal or other organizations with kindred objects are to be admitted into membership. The permanent organization was formed with officers as follows:

President, Frank J. Bock, Newark; vice-president, A. J. Rider, Hammonton; secretary, T. D. Sensor, Trenton; treasurer, Henry B. Kummel, Trenton. Vice-presidents are to be named for each county and of this number the following have already been selected: Joseph M. Roseberry, Warren; Henry H. Isham, Union; Joseph Douty, Somerset; Robert Hartshorn, Monmouth; Dr. M. J. Douglass, Cape May; F. Dunham, Hudson; Joseph Evans, Burlington; Levi H. Morris, Sussez, and Edward A. Wilson, Atlantic. The others will be selected before the next meeting of the association in February.

Water Conservation in New Jersey.

In a report submitted to Governor Stokes, of New Jersey, January 20, 1908, the State Water Supply Commission emphasizes the importance of adopting some adequate system for the conservation of the potable waters of New Jersey. The commission does not attempt to decide the relative merits of the plans proposed by the Passaic Flood Commission and the Geological Survey, but declares that the propositions to prevent a recurrence of floods and preserve the water supply lent themselves so admirably to the solution of both problems that it would be almost a crime if the two advantages could not be combined as proposed. The commission points out that the passage of the act under which it was created was in line with the action which had been taken in several other states, notably in New York and Pennsylvania. In these states the importance of taking immediate steps for the conservation of water supply for potable purposes has been recognized. The New Jersey commission has been impressed with the fact that action on the part of this state has been taken none too soon to provide an equitable distribution among the several communities and a conservation of the potable waters for their growing population before such waters may be acquired by private corporations. The second annual message of Governor Stokes urging prompt action upon the subject is extensively quoted from in the report. What has been acomplished in Massachusetts and what is now being accomplished in New York is then pointed out. The report continues with some detail regarding the various projects for the Passaic improvement.

State Control of Sewerage and Water Supply in Pennsylvania.

In an address before the Engineers' Society of Western Pennsylvania, Mr. F. Herbert Snow, the chief engineer of the State Department of Health gave an interesting account of the history of the Board and its present powers over the sewer systems and water supplies of the state from which the following facts are gathered:

Prior to 1885 the state had no health department, but the typhoid fever epidemic that year resulted in the passage of the first law regarding state supervision of health matters, if one may neglect statutes passed in 1828 prohibiting pollution of Fairmount reservoir, in 1832 of Schuylkill river and in 1874 of water supply reservoirs generally.

The law of 1885 was comparatively ineffective and was improved but little until 1899 when the Board was authorized to examine the water supplies of cities of the first class and was given some powers over the Schuylkill river and its tributaries, which were rendered largely ineffective by the indefiniteness of the law.

Another epidemic, that at Butler in 1903-4, was required to show the necessity of the exercise of greater powers by the health authorities and resulted in the acts of 1905, which now govern the State Department of Health.

Under one act the Commissioner has power to investigate and abate nuis-

ances or questions affecting the security of life and health in any locality.

Under another act the Commissioner has certain powers and duties regarding sewerage and water supply. Sewage and manufacturing waste, other than the discharge from mining and tanning operations, which are a menace to public health, are subject to regulation by him and their discharge into streams or bodies of water without purification can be prohibited by him. The law expressly excepts from the provisions of the act the discharge from city sewers already constructed at the time of passage of the act, but it will gradually bring them all under its influence by virtue of the provision that no extension of any existing system can be made without the approval of the Commissioner of Health. The Commissioner with the approval of both the Governor and the Attorney General may permit the discharge of sewage into a stream and fix the conditions under which this can be permitted. Heavy penalties are provided for violation of regulations.

Provisions of the same act require every company, corporation or individual supplying water to the public to file copies of plans and description of source of supply with the Commissioner of Health and prohibit any new construction or extension without written permit from him. He has no power over plants in operation prior to April, 1905, except as to extension and new construction.

The state gives effectiveness to the work by the appropriation of over $2,000,000 for the expenses of the department for two years.

Patents on Sewage Purification Process Sustained.

The United States Circuit Court of Appeals, second circuit, has rendered a decision in the case of the Cameron Septic Tank Co., versus Saratoga Springs, brought before it on appeal from the U. S. Circuit Court of the northern district of New York. The decision of the lower court dismissed the bill for infringement of patent on the Cameron process and apparatus for treating sewage, but the decision of the higher court reverses the decision in part and returns the case for verdict according to its decision.

In brief the opinion states that the term "septic" is a new one introduced by Mr. Cameron, and the separation of the working conditions of anaerobic and aerobic bacteria so that each class may have its full opportunity for action, the septic tank as prepared and designed for the work of the anerobic bacteria, especially as to exclusion of exygen and steadiness and quietness of flow resulting in liquefaction of the organic matter in the sewage, and the combination of the septic tank thus described with apparatus for subjecting its liquid effluent to air and light are new processes fairly subject to patent.

The opinion of the court is definite as to the application of the decision to the combinations of septic tank and aerating or filtering devices and not so definite as to its application to the septic tank alone. The decision, however, sustains the patent on claims 1, 2, 3, 4, and 21, of which claims 2 and 21 are concerning the septic tank alone and the others include the combination with aerating and filtering apparatus. The application of the septic tank patent to tanks constructed and in operation some years before the date of application for patent is discussed editorially in this number of MUNICIPAL ENGINEERING.

The validity of the claims in the patent covering the process is definitely sustained, but claims 5, 6, 7, 8, 11, 12, 21, 22 are not sustained as they are upon parts of the apparatus not new in principle. The decision of the lower court on these claims is therefore affirmed.

MUNICIPAL AND TECHNICAL LITERATURE

Pavements in Portland, Me.

The annual report of Bion Bradbury, Jr., commissioner of public works at Portland, Me., shows that during the eleven months ending November 30, 1907, 26,724 square yards of permanent street paving were laid on various streets. This consisted of 8,235 square yards of granite block, 12,230-square yards of bitulithic, 249 square yards

of brick, 5,000 yards of concrete, and relaying 5,084 square yards of granite block paving. In addition to the above, 22,351 square yards of new macadam and 18,044 square yards of macadam resurfacing were laid, making a total, including permanent work, of 72,805 square yards. During the year 1.84 miles of sewer was laid.

Improvement in Birmingham.

The report of Julian Kendrick, city engineer of Birmingham, Alabama, shows that during 1907 the total expenditures for improvements were $337,000, as follows:

Vitrified brick pavement, 1.2-mis.	$105,000
Bitulithic paving, 3.7 mis.	141,000
Grading and macadamizing, 3-mis.	23,000
Sidewalk improvements	15,000
Sanitary sewers	14,000
Storm sewers	5,000
Gutter paving	16,000
Curbing	18,000
Total	$337,000

The city now has practically 18 miles of streets paved with bitulithic and vitrified brick.

Pavements in Omaha.

The preliminary report of Andrew Rosewater, city engineer of Omaha, Neb., for 1907, shows that 37.21 miles of permanent sidewalks, 7.54 miles of sewer, 9 miles of pavements, and 17 miles of curbing were constructed during the year. The city now has 252 miles of permanent sidewalks, and the engineer reports that there are 42 miles of wooden sidewalks, most of which are in a dilapidated condition. The pavements constructed during the year were as follows:

	Laid during 1907.	Total to date.
Stone	.042	25.517
Brick block	5.322	24.047
Asphalt	3.007	44.374
Macadam	.627	4.697
Wood	—.	6.007
Totals	8.998	104.669

New Publications.

Sanitary Engineering with Respect to Water Supply and Sewage Disposal. By Leveson Francis Vernon-Harcourt. Cloth, 419 pp. 287 illustrations. $4.50 net. Longmans, Green & Co., London and New York.

The author has prepared an excellent book for Longman's Civil Engineering Series, probably under some restriction from the publisher with regard to size of book.

Within the limits of 284 pages, as compared with 733 in Turneaure and Russell's "Public Water Supplies," the author has made as good a book as the American work. The limitations of space have restricted most of the departments considerably and such subjects as quality of water and effect on health, formulae and tables of computations, peculiarly American forms of dams, mechanical filtration, pipe lines, pumping machinery, stand pipes, and tanks, are either very lightly touched upon or are entirely omitted. With this limitation and the further fact that the author is an Englishman and writes from the English point of view and experience, though drawing many illustrations from American practice, the reader may accept the book as an excellent statement of the principles of modern practice.

The various chapters discuss rainfall, sources of water supply, wells, deep wells, lakes and storage reservoirs, earthen and rubble reservoir dams, masonry dams, typical masonry dams, intakes and conveyance and storage of supply, purification of water supplies and distribution of water supply.

The section of the book on sewage disposal is still more restricted in space, and covers only 110 pages. The treatment is therefore very brief, but it is authoritative and thorough as far as it goes. Plumbing is always treated in an English book and that subject with garbage and refuse destruction take one chapter of 23 pages. Sewerage lines, outfalls and clarification of sewage, utilization and purification of sewage on land, and chemical, electrolytic and bacterial purifications of sewage are the subjects of the other chapters, each covering 12 to 25 pages.

The general reader on engineering subjects will find this an interesting book, and the practicing engineer will find many valuable pointers, the author evidently having had much experience in the field he covers.

Text-Book on the Strength of Materials. By S. E. Slocum, B. E., and E. L. Hancock, M. S. Cloth, 328 pp. $2.15. Ginn & Co., Boston, Mass.

The authors divide this book into two parts, one for the class room and the other for the experimental laboratory. They devote the first two chapters to a general discussion of the relations between stress and deformation and to a demonstration of the elementary theorems which are the basis of the special rules of calculation afterwards developed, such as

Hooke's law, the elastic law, temperature effects, factor of safety, equations of principal stresses, shear, coefficient of expansion, stresses due to bending and torsion, etc.

Subsequent chapters give the analysis of the stress in beams, including the theorems on the moment of inertia and methods of designing beams for various loads and of various cross-sections; the flexure of beams, supported and continuous; the design of columns and struts, with the various formulae; the mechanics of torsion; the design of spheres and cylinders under pressures, internal and external; flat plates; curved pieces, for which the authors claim the only rigorous and at the same time simple general treatment in any American text-book; arches and arched ribs; and foundations and retaining walls, including the theories of earth pressure.

The second part describes the machinery and methods of testing iron and steel in tension and torsion, by impact, cold bending, etc., and the effects of differences in chemical composition; the methods of testing lime, cement, and concrete; reinforcement for concrete and the testing of concrete beams; compression, abrasion, absorption and transverse tests of stone, brick and brick work; the testing of timber, rope, wire and belting.

The book is not exhaustive but may serve as an aid to the instructor in leading a class through the subject. There are some evidences of uncertain thinking and careless expression which will add to the difficulties which the subject has naturally for the individual student. As examples may be cited some of the steps in the derivation of the differential equation of the elastic curve; the statement that "the points of application, do a certain amount of work"; the definitions of the parts of an arch; the explanation of the effect of removing an arch center; some sentences in the development of Winkler's criterion for arch stability. Lack of practical knowledge of materials and construction experience is shown in the discussions of footings and foundations, the definitions and treatment of cements and stones.

Handbuch fuer Eisenbetonbau. By Dr. F. von Emperger and others. Third volume, first part; engineering structures. Foundations by Dr. F. von Emperger; masonry structures by A. Nowak; water way structures by Prof. F. W. Otto Schulge. 330 pp., 547 figures. 4 folding plates. Paper, $4.00. Wilhelm Ernst & Sohn, Berlin, Germany.

MUNICIPAL ENGINEERING has noticed each year the "Beton Kalender" issued by Wilhelm Ernst & Sohn, who also publish "Beton und Eisen," and that publication has had considerable circulation in this country and a very large circulation in Germany, on account of its practical nature and the everyday use that can be made of it. The object of the present publication is to expand the treatment of the various subjects considered in the little book, to give more detail, more examples and more thorough methods of computing strength and dimensions of structures and their parts.

The present volume takes up the heavier structures named in the paragraph descriptive of the book.

Dr. von Emperger considers foundations for canal locks, buildings, walls, towers, abutments for bridges and arches, machinery, reservoirs, underground and supported on walls, coal pockets, elevators, mills, quays, pile foundations in various forms and combinations, pile protection, landing stages, trestles, caissons, etc., all in reinforced concrete. His chapter is notable for the detail with which he treats the examples showing the method of computing the dimensions required for the foundations and the various parts of their structure.

Mr. Nowak discuses walls, the forms for making them and the outer finish and the methods of distributing reinforcement and computing dimensions of concrete and reinforcement. He gives many drawings to illustrate his treatment of the theory of the resistance of walls of buildings, retaining walls, reservoir and warehouse walls, abutments, piers, etc., and many examples of methods of constructing the various kinds of walls, and of computing their dimensions.

Professor Schulge decribes reinforced concrete structures used to retain water in much detail, but pays much less attention to the computations. His chapter occupies nearly half the book and covers the ground most thoroughly, as to walls, dams, entrance chambers to water wheels, dry docks, light houses, bank and shore protection, reinforced concrete, boats, etc.

The plan of putting each chapter in charge of an expert in that line gives the same authority to this book which the little book at once assumed and the greater detail warrants the great enlargement of the plan and the material increase in price. Examples are taken from all parts of the world and the number from the United States

is fully equal to the importance of the work in this country. The book is in greater detail than the books published in this country and in England and the completed volumes proposed for the entire work will be an encyclopedia of reinforced concrete construction, judging from the single part of the third volume which is at hand. Engineers who can read German should have all the volumes.

A Manual of Hydraulics. By Prof. R. Busquet. Translated by A. H. Peake, M. A. 312 pp. Cloth, $2.10 net. Longmans, Green & Co., New York City.

One thing which makes this book interesting is the widely differing opinions which have been expressed concerning it. One prominent engineering journal says: "It is rather surprising that the first good elementary book published in this country on hydraulic power development should be an English translation of a French work, for it was the American development of standard types of turbines of fair efficiency and moderate cost which, with electric power transmission, made what may be called elementary water power plants attractive commercial propositions." Another says: "On both the theoretical and the practical side the imperfections are so numerous that one wonders why an English translation should have been made. The author and the translator claim that the book is of value not only for technical schools, but also to those engaged in the development of hydraulic power. In the opinion of the reviewer, however, it is an unsafe guide for both students and engineers."

The translator says it "expounds the principles underlying the use of water power and discusses the application of these principles to almost every type of hydraulic prime mover in commercial use, showing the relative merits of and the circumstances favorable to each type."

The author says: "The book itself is not a purely descriptive work, designed merely for popular use, nor is it an abstruse treatise suitable only for engineers versed in higher mathematics. It is a text-book of applied hydraulics, in which complete technical theories and all useful calculations for the erection of hydraulic plants are presented. In it no recourse is made to other operations than those of arithmetic and elementary geometry."

The fact seems to be that the book is written by a professor in a subordinate technical school for the use of students not familiar with mathematics. Whatever his intention, he has compiled an elementary book, largely from the earlier text-books, possibly those of his own school days, which ought to be very useful to those for whom it was prepared. There is a class of students in England who seem to require similar books, if one may judge from the number of them in other branches of engineering, and the translation is made by a Cambridge University professor in the style and language appropriate to them. While the later investigations and formulae, such as Kutter's, are not mentioned, this is not a serious matter for the class of readers the book is intended to serve.

The chapters of the book discuss the fundamental laws of hydraulics, the flow of liquids in delivery pipes and open canals, water wheels, turbines, and the construction of a waterfall. Turbines occupy the most space, 80 pages, and the various types are clearly explained. The writer can not quite agree with the statement of the author, quoted above, in his use of the words "complete" and "all," but he does not believe the book is a dangerous one, as the second reviewer quoted would have us believe.

The Elastic Arch, with Special Reference to the Re-enforced Concrete Arch. By Burton R. Leffler, Asso. M. Am. Soc. C. E. Cloth, 57 pp., 5 plates. Henry Holt & Co., New York City.

The author informs us in his preface that he bases his work first on Eddy's application of the equilibrium polygon to arches as modified by Cain, and which he has still further modified to shorten the process without materially affecting its accuracy. He also acknowledges his indebtedness to Howe for the discussion of the effect of axial thrust. The new features he claims are the deduction of the methods from one smiple equation and an easy method of drawing the closing line of the equilibrium polygon, which he first presented in a paper before the American Society of Civil Engineers, which appears with discussion by Professor Cain, W. J. Watson and A. H. Fuller in the volume of transactions for December, 1905. He also presents, he believes for the first time, a simple method of designing a reinforced concrete section for combined thrust and moment, which he believes to be correct, and a graphical analysis of an arch for oblique forces, based on a hint by Professor Cain.

The draftman's difficulties in designing reinforced concrete arches seem to the writer, who does not have a practical drafting-room experience, to have been met in very satisfactory manner, and, while either the draftsman or his chief must know much of the theory of the arch as laid down in the larger treatise before he can understand all his work and be sure he has reached the right results, the ordinary office draftsman can be taught readily to carry forward all the operations to a successful conclusion and

his results can be readily checked by the chief draftsman.

The discussion of theories is short and concise, but presupposes the knowledge of other books referred to and so will be rather blind reading to the common draftsman, but puts the theory in good shape for the head of the office. It is also in such shape that the engineer who has only an occasional arch to design need not go over the whole detail of theory every time in order to refresh his memory.

The author "has allowed himself to indulge in some pungent remarks" in his appendix, which are to the point but some of which detract from the judicial character which a book of this sort should maintain.

Boiler Waters, Scale, Corrosion, Foaming. By William Wallace Christie, M. Am. Soc. M. E. Cloth, 235 pp., 77 illustrations, $3 net. D. Van Nostrand Company, New York City.

As the author states in his preface, this is a pioneer book upon its subject. He has been careful to give the authority for every statement he makes, and so much of the book is in quotation marks that it gives one the feeling that it is a note-book of collected information arranged under appropriate headings. This is not objectionable in principle, but there is not always sufficient warning as to the competence of the authority quoted. In a subject which is still so largely empirical in the treatment accorded it, the character of the reporter of the conditions and results observed is of much importance. The steam user will, however, find the book of much interest and value for its information about methods of pumping, notwithstanding its omission of some of the best methods of analysis of boiler waters.

The headings of the chapters under which the information given is grouped are water, its properties, contents and analysis, boiler scale and conductivity, corrosion, feedwater and blow-off pipes and tubes, priming and foaming, oil, grease and zinc, hardness, feedwater heaters and economizers, water softening, miscellaneous tables.

There is still room for a scientific treatment of this subject of boiler waters, but meantime the engineer can make good use of the present practical volume.

Heat and Light from Municipal and Other Waste, written for Municipalities and Engineers. By Joseph G. Branch, B. S., M. E. Cloth, 305 pp., 56 illustrations, $3. Wm. H. O'Brien Printing and Publishing Co., St. Louis, Mo.

The appearance of this book caused some acrimonious discussion, which has now ceased, and it may now perhaps be described as it is, without further disturbance. The preliminary chapters contain general statements of the author's opinions regarding methods of garbage disposal in his work as a municipal official in St. Louis, and one of these contains a report on the subject to the sanitary committee of the city council. His mind is made up in favor of the incineration of mixed refuse, including all the refuse of the city, and for the utilization of the resulting heat in the production of steam for useful purposes.

The successful plants of this kind being in England, he gives data from these plants, mainly taken from Goodrich's "Refuse Disposal and Power Production." He also gives data from about 75 American cities regarding disposal of refuse. In compiling this list he has evidently had the same difficulties which others, including the U. S. Census Bureau, have found, and his information does not agree always with that given by others. Possibly he is right, possibly all are wrong, there is no way of determining except personal investigation of the ground. MUNICIPAL ENGINEERING has tried its hand at the collection of such statistics with a result to be shown in a future article, which may or may not be as nearly correct as the chapter in the book. At least it is of later date. This chapter also contains some statements of bids made by various furnace makers for garbage incinerating plants, which are valuable for comparison.

The author has designed and invented a furnace which he describes in one chapter, which also gives specifications for its construction, and elsewhere drawings for building and grounds are found. An estimate is made for a combined incinerator and electric light and pumping plant. The advantages of mechanical draft and the advantages and disadvantages of various forms of boilers for use in the combination plants are also set forth.

A large part of the book, some 150 pages, is taken up with matter really irrelevant to the subject, because it goes into details beyond that subject, such as steam and hot water heating, elements of electricity, specifications and other details about boilers, engines and pumps, comparison of fuels and forms of franchises and ordinances, which are better treated in books wholly devoted to these subjects.

The author has made a good case for the destructor and for high temperatures in its furnace, and has indicated the modifications in American practice which will probably make incineration as successful and as profitable in this country as in England, mainly in the collection of all refuse, without separation, according to the English plan. If his book will hasten the spread of these ideas, it will have done its full duty. Possible bias in favor of his own invention should not prejudice the reader against the more scientific parts

of the book, in which he works out his conclusions, although it has occasionally led the author to incomplete statements concerning the performance of other furnaces and other processes.

Concrete Factories. An illustrated review of the principles of construction of reinforced concrete buildings, including reports of the sub-committee on tests, the U. S. Geological Survey, and the French rules on reinforced concrete. 152 pp., $1. Bruce & Banning, New York City.

The newest contribution to cement literature, and one for which there has been a demand for a long time, is "Concrete Factories," a series of papers descriptive of the uses of cement and concrete as applied in the construction of industrial plants. It is compiled by Robert W. Lesley, Asso. Am. Soc. C. E.

This book offers in condensed form a review of the principles underlying reinforced concrete construction that has yet been published, and has the still further advantage of being understood by the layman as well as the engineer. The book contains the report of the United States Advisory Board on Fuels and Structural Materials, the report of the sub-committee on tests, the only translation of the French rules on reinforced concrete, which have just been issued by the Ministry of Public Works in France, and a number of profusely illustrated articles showing the methods of reinforced concrete construction, including all the well-known reinforcing systems.

"Reinforced Concrete Construction," a chapter by Walter Mueller, is a concise description of the many concrete reinforcing systems now in the market, and "Concrete in Factory Construction," by E. A. Trego, reviews the work that has been done with concrete in the construction of industrial plants during the past few years.

The book also contains "A Surface Finish for Concrete," by Henry H. Quimby, M. Am. Soc. C. E., and a symposium of articles on the use of concrete in constructional work by Emile G. Perrot, C. A. P. Turner, E. P. Goodrich, J. E. Worcester, Dean & Main, Leonard C. Mason, E. S. Larned, Chester J. Hogue, J. G. Ellendt, A. E. Lindau and other eminent authorities on construction work.

ORGANIZATIONS AND INDIVIDUALS

Forest Reserve Agitation—Iowa Engineers—Iowa Cement Users—Technical Meetings—Civil Service—Harry J. McDargh—Richard K. Meade—James N. Hazlehurst—Personal Notes.

Forest Reserve Agitation.

The American Civic Association has taken up the question of forest reserves in the Appalachian mountains, with the same energy which characterized its campaign for the preservation of Niagara Falls and it is hoped that it will meet with the same success. To do so all those interested must aid, and the association is now sending out circular letters explaining the present conditions and asking each one to interest his congressman and the newspapers in his community in the bills that have been presented looking toward the establishment of forest reserves in the southern Appalachian mountains and the White mountains. These bills are Nos. 20, 10456, 10457 and 11357 of the House of Representatives, which are the subject of conference at Washington as this number of MUNICIPAL ENGINEERING goes to press.

The Iowa Engineering Society.

The twentieth annual meeting of the Iowa Engineering Society was held at Des Moines, Ia., on Jan. 8-9, 1908, with an attendance of about forty members. Vice-president Arthur J. Cox presided.

The following papers were presented and discussed: "The Development of Iron Mining in Iowa," by J. G. Ratcliffe, Waukon; "Chips from Along the Line of Experience," by S. Schreiner, Des Moines; Reports of the Committee on Structural Engineering by W. H. Jackson, Des Moines; on Sanitary Engineering, by A. Marston, Ames; on Surveying and Drainage, by Seth Dean, Glenwood; on Railroad Engineering by

W. G. Raymond, Iowa City, on Factory Engineering, by L. B. Spinney, Ames; on Roads and Pavements, by T. H. MacDonald, Ames; "Street Grades" by F. W. Dusey, Creston; "Paving Adjacent to Street Railway Tracks," by G. D. Dobson, Des Moines.

Among the pleasant features of the meeting were visits to the Locust street concrete bridge under construction and the factory of the Des Moines Bridge and Iron Works. The society was tendered a banquet by the Des Moines Engineers' Club at which G. D. Dobson acted as toastmaster and toasts were responded to by C. R. Allen, B. Schreiner and L. H. Stone.

The officers of the Society for the coming year are: President, Arthur J. Cox, Iowa City; vice-president, C. T. Wilson, Waterloo; secretary-treasurer, A. H. Ford, Iowa City; directors, C. R. Allen, Ottumwa and W. H. Jackson, Des Moines.

Iowa Association of Cement Users.

That the efforts of the officers of the Iowa Association of Cement Users are being rewarded is evidenced by the great interest manifested by cement users, manufacturers and equipment firms in the coming convention in Des Moines, February 19, 20 and 21, 1908. Already a considerable amount of space has been reserved for exhibits and a number of good papers and addresses on pertinent topics are promised for the program.

The sessions of the convention will be held in the large assembly hall of the Saver hotel, which is to be the headquarters. The exhibits will be placed in the convention hall and the corridors and parlors of the hotel. Negotiations are under way for suitable ground floor space conveniently near headquarters where machinery may be shown in operation. The management is confident of success in this matter and prospective exhibitors may depend on a good location for machinery to be operated.

Space for exhibits may be reserved by application to Ira A. Williams, secretary, Ames, Iowa, or to the manager of Saver hotel, Des Moines, Iowa. The fee for space is ten cents per square foot occupied, with a minimum charge of five dollars to one exhibitor.

For the program are already listed President R. L. Humphrey, of the National Association; Dean A. Marston, Iowa State College; Thos. H. MacDonald, of Iowa Highway Commission; H. K. Dodge, construction engineer; F. L. Reeder, engineer of bridges and culverts, and a number of others who promise papers bearing on the various lines of cement work that will be profitable to all to hear.

Des Moines is without question the convention city of Iowa. Its central location makes it easy of access from all parts of the state, and located as it is on several main lines of railroad, is readily reached from surrounding states. Des Moines hotels are not excelled anywhere, and the city's reputation for entertaining visitors is widely recognized. There are various manufacturing plants to be visited besides pleasure places to the satisfaction of the most fastidious.

Technical Meetings.

The fifty-fifth annual meeting of the American Society of Civil Engineers was held January 15 at the house of the Society in New York City. Over 700 were in attendance. Officers were elected as folows: President, Chas. MacDonald, New York City; vice-president, Mordecai T. Endicott, Washington, D. C.; George F. Swain, Boston, Mass.; treasurer, Joseph M. Knapp, New York City; directors, Chas. L. Harrison, New York City; George W. Kittridge, New York City; Dexter Brackett, Boston, Mass.; Horace Andrews, Albany, N. Y.; Gardner S. Williams, Ann Arbor, Mich.; Charles F. Churchill, Roanoke, Va.

The annual meeting of the New England Water-Works Association was held in Boston, Mass., January 8. Officers for the ensuing year were elected as follows: President, Alfred E. Martin, superintendent of water-works, Springfield, Mass.; Messrs. Kent, Bancroft and Sherman were elected secretary, treasurer and editor respectively, advertising agent, Robert J. Thomas, Lowell, Mass. A paper on "Experience with a Producer Gas Plant" was read by Harry L. Thomas, assistant superintendent of Water Company, Hingham, Mass. F. F. Forbes, superintendent of water-works at Brookline, Mass., read a short paper on "One Year's Experience with an Automobile for Business by a Water-Works Man" in which he detailed briefly the misgivings of the local authorities before deciding to purchase an automobile for the use of the superintendent. He summed up the results of its use as a great increase in efficiency of the superintendent, equivalent in general to a material increase in the length of his working day. The machine was a runabout, and cost, equipped and ready for service, about $800. The actual maintenance

cost for the year had been about $275. Allowing for overhauling once a year, and that depreciation would be such that the machine would be discarded at the end of four years, he figured the total cost per year at about $575 or $1.56 per day. Several other superintendents, speaking in discussion, recited substantially similar experiences. Mr. Dexter Brackett, Chief Engineer of the Metropolitan water-works, said that those works were now using three automobiles, and that in his opinion the saving in time was the principal advantage from their use; at least in one case, the automobile was practically worn out at the end of three years. Mr. William F. Sullivan, of Nashua, N. H., gave some figures on the operating cost in his case; actual maintenance cost being $51.19 for 2,300 miles. A paper on "Action of Water on Water Pipes" was read by Freeland Howe, Jr., of Norway, Me.

The annual convention of the National Brick Manufacturers' Association will be held at Columbus, Ohio, February 3, 4, 5, 6, 7 and 8. Theodore A. Randall, secretary, Indianapolis, Indiana.

The annual convention of the American Ceramic Society will be held at Columbus, Ohio, February 3, 4 and 5. Edw. Orton, Jr., secretary, Columbus.

The annual meeting of the Connecticut Society of Civil Engineers will be held at New Haven, Conn., Feb. 11 and 12. T. F. Jackson, sec'y., New Haven.

The annual convention of the Ohio Engineering Society will be held at Columbus, Ohio, February 11 and 12. E. G. Bradbury, sec'y., 85 N. High st., Columbus.

The National Association of Comptrollers and Accounting Officers, Howard C. Beck, Detroit, Mich., secretary, publishes its proceedings in an annual volume which contains much of value to municipal officials. One of the papers from the last volume is printed in this number of MUNICIPAL ENGINEERING. This association will undoubtedly be a great aid in extending the use of uniform methods of accounting throughout the United States. This idea has gained a foothold in a few states and some good results have been obtained already. The differences in laws and customs of the various states inevitably bring about differences in forms of accounting and reporting, but a national body of the experts in accounts ought to be able to induce a uniformity in the principles on which the systems of accounting are based so that the differences will be only superficial and not vital.

The Municipal Engineers of the City of New York meet monthly and in the course of a year the proceedings produce a volume of more than 200 pages upon bridges, pavements, water supply, tunneling, testing materials, foundations, etc., by members having high standing in the profession, long and valuable experience.

The 28th annual convention of the American Water-Works Association will be held at Washington, D. C., May 11-16, 1908. Geo. H. Felix is president and J. M. Diven, Charleston, S. C., is secretary.

The National Civil Service Reform League is calling attention to the attempt now being made in Congress to exempt the large additional clerical force required for the census of 1900 from control by the Civil Service regulations and asks assistance in impressing upon Congressmen, individually and collectively, the discredit to the accuracy of the census which is likely to result from such a step.

The Mining Section of the Canadian Society of Civil Engineers will hold a meeting on Feb. 6 and the General Section on Feb. 20, at the rooms of the society in Montreal at 8 p. m.

Civil Service Examinations.

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

Feb. 5-6 for topographic aid in the Geological Survey at $840 to $1,200 a year; also for nautical expert in the Hydrographic Office at $1,000 a year.

Feb. 19-20 for draftsman and artist in the Division of Publications, Department of Agriculture, at $1,200 a year.

James Nisbet Hazelhurst.

From a recent number of the Atlanta Constitution the following interesting account of the professional career of one of the prominent engineers in the south is taken:

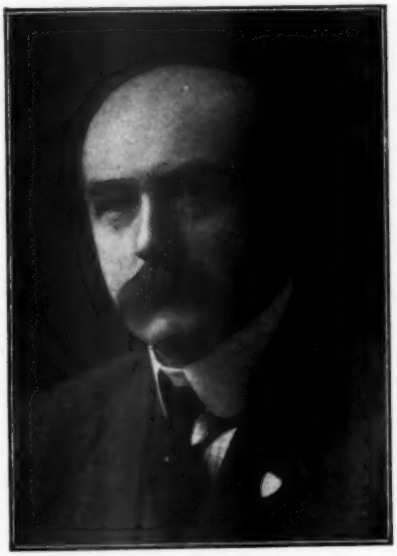
James Nisbet Hazlehurst, late chief engineer to the board of public works of Mobile, Ala., announces the establishment of an office in this city for the practice of his profession and from which it may be inferred that Georgians, like chickens, all come home to roost. Mr. Hazlehurst comes of the seaboard Georgia family of that name, and through the maternal side of Nisbet and Wingfield stock of middle Georgia has a wide family connection. Colonel George H. Hazlehurst, the paternal ancestor, was during his day one

of the pioneer railroad men of this section and was an engineer of marked ability and highest standing.

Determined to follow his father's profession, Mr. Hazlehurst's early education was had at the Neal Military academy, at that time near the city, and at the height of its reputation as a preparatory school.

Completing his education at Sewanee Mr. Hazlehurst had the good fortune to study engineering under General E. Kirby-Smith, renowned not only as a soldier, but as well an instructor and mathematician of a high order. Upon leaving the University of the South and entering the world's broader school of applied knowledge, Mr. Hazlehurst held subordinate positions in western engineering corps and later was employed with the once prominent Georgia firm of A. J. Lane & Co., railway contractors, and with which Colonel Hazlehurst was financially interested. Later, after taking a course at the School of Design in Cincinnati, Mr. Hazlehurst resided in Chattanooga, Tenn., being interested in the management of the city water-works, and also manager of the Lookout Iron Company, a large manufacturing plant of that city. Shortly after his marriage in Chattanooga, Mr. Hazlehurst's health failed and he moved his family to Macon, Ga., where he established an office for the practice of his profession under the firm name of Hazlehurst & Hendrick. The junior partner, Mr. Hendrick, was city engineer, and resigned later to accept an important engineering engagement with the New York subway, from which he has later been called to Baltimore to design and construct its sewer system as chief engineer at a salary of $10,000 per year. After a year or two spent in this partnership Mr. Hazlehurst was appointed chief engineer of one of the independent short lines of Florida, making headquarters at St. Augustine. In 1894 he returned to Macon and was appointed, with the late Virgil Powers and A. Dannenberg, charter members of the Macon board of public works, as then constituted. In 1894 Mr. Hazlehurst resigned this political office and was retained by Messrs. Gaboury & Noble, general contractors, as constructing engineer on 50 miles of sewer work in Macon for which they had contracted. Early in 1895 Mr. Hazlehurst established an office in the old Norcross building, this city, under the firm name of J. N. Hazlehurst & Co., of which Mr. Nisbet Wingfield, now commissioner of public works and city engineer, Augusta, Ga., was junior partner.

During that year this firm executed many engineering and other contracts in the southern states, at the same time holding the Atlanta city contract for that year for constructing all the sewers ordered for that period; they also installed the extensive systems of water-works and sewers for the exposition at Piedmont park. The year following Mr. Wingfield being appointed to design and construct the new city waterworks at Augusta, the partnership terminated and Mr. Hazlehurst continuing alone in his practice; during the period, designing and constructing numerous water-works, including those at St. Augustine, Fla. In 1898 Mr. Hazlehurst was engaged by the city of Tampa to prepare plans for sewer and street paving and supervised the construction of these works, aggregating almost a half million of dollars. From Tampa Mr. Hazlehurst came as supervising engineer for the contractors of the Mobile city waterworks, and upon its completion he was retained under a three-year contract by the board of public works of that city, remaining there for five years and resigning during the past year to accept the appointment as chief engineer at Pensacola to construct waterworks, sewers and pavements, and for which three-quarters of a million dol-



JAMES N. HAZLEHURST, C. E.,
ATLANTA, GA.

lars had been appropriated. This engagement Mr. Hazlehurst was prevented from filling through a desperate illness from which he has only recently recovered. At present he is consulting engineer to a number of southern cities, probably the most important of these engagements being at Natchez, Miss., for storm sewers and street paving; complete water and sewer systems at Rome, Ga., for which $300,000 is to be expended; waterworks at Gadsden, Ala., and Sweetwater, Tenn., etc.

Mr. Hazlehurst is a member of numerous scientific societies, among which are the national associations, the American Society of Civil Engineers, the American Society of Municipal Improvements and the American Waterworks Association.

During his active practice Mr. Hazlehurst has devoted considerable time to technical literature, his most ambitious work being a monograph on "Towers and Tanks for Water-works," now in its third edition; besides being a frequent contributor to the various scientific magazines.

As an old resident of the city, Mr. Hazlehurst marks many changes and a vast improvement and expressed himself as delighted to return to Atlanta, which he expects to make his permanent home. Like every one else, he is most optimistic on the subject of "Greater Atlanta."

Richard Kidder Meade.

The Chemical Engineer is one of the contemporary publications which touches the field of MUNICIPAL ENGINEERING at one or two points such as the chemistry of the cement industry, and of paving materials. It has been ably conducted since 1904 by Richard K. Meade, who, with Clarence E. Kline, operates the Meade Testing Laboratories in Nazareth, Pa.

Mr. Meade is well equipped by education and experience for his dual relation. He was educated at the University of Virginia in mechanical engineering and chemistry and followed this by a year as chemist of the Longdale Iron Co., and four years as assistant professor of chemistry at Lafayette College. He entered the cement field as chemist for the Edison Portland Cement Co. in 1901, and had later engagements with the Northampton and Dexter Portland Cement companies. His ability as an editor and author is shown not alone by the magazine he edits but also by the "Chemists' Pocket Manual," "The Chemical and Physical examination of Portland Cement," "Design and Equipment of Small Chemical Laboratories," books of much practical value, and by many papers in the transactions of the American Chemical Society, and the American Society for Testing Materials and in the Chemical

RICHARD K. MEADE, NAZARETH, PA.

Engineer, MUNICIPAL ENGINEERING and other engineering journals. He is a member of the American Society for Testing Materials, the American Chemical Society, the Society of Chemical Industry, the New York Chemists' Club and the Sons of the Revolution.

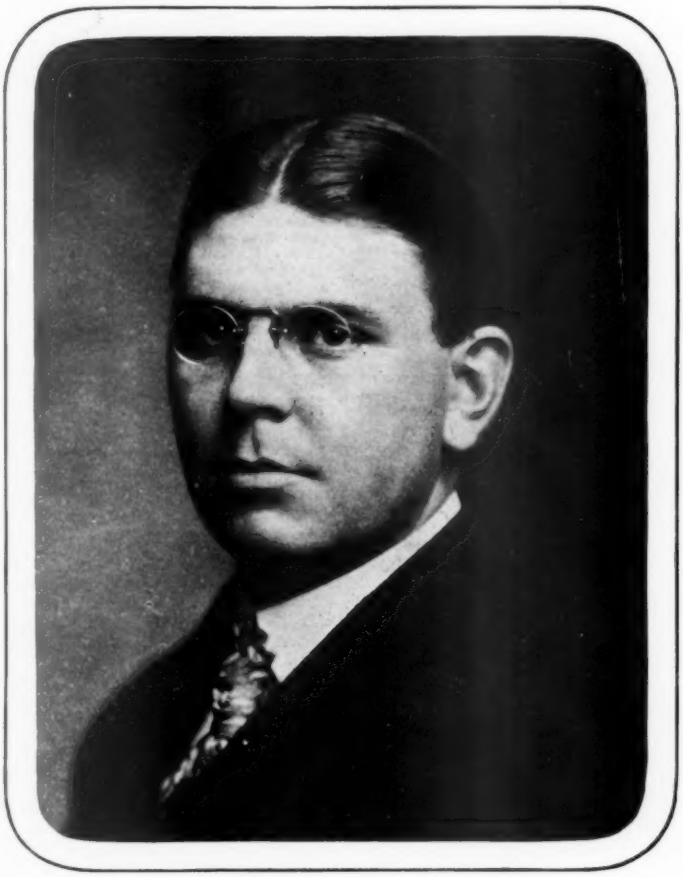
The Meade laboratories and Mr. Meade, himself, have had charge of the testing of over five million barrels of Portland cement used in government municipal and other important work and have investigated materials for the manufacture of cement from all parts of the United States and Canada, as well as conducted many other important investigations.

Harry J. McDargh.

An engineer who has been faithful to his early home is Harry J. McDargh who received his early education in Dayton, O., and after his graduation from Rose Polytechnic Institute and about five years of railroad experience returned to Dayton and has made it his headquarters ever since.

Mr. McDargh has had some municipal experience as first assistant city engineer in charge of street paving and sewers and engineer of the Dayton waterworks department in full charge of operation and maintenance. In less than two years the receipts of this department under his control increased from $135,000 to $160,000 a year. He designed and is now completing an automatic direct system booster plant for supplying water to the hilltops in the eastern and southern parts of the city, which will cost $110,000.

He has also maintained during the past four or five years an office as consulting civil and hydraulic engineer. Waterworks plants, principally in Ohio, designed and constructed under his direction have cost $175,000 and he is also responsible for the plant of the Esmeralda Water Co., at Goldfield, Nev. He has also been employed in the development of water powers including one of 14,000 h. p. in South Carolina, one of 10,000 h. p. in Kentucky, one of 12,000 h. p. in British Columbia, and several small plants in Ohio, Indiana and Michigan. Many small steel and reinforced concrete bridges and systems of sanitary sewers, including one with 28 miles of pipe, are also incidents in his practice. Mr. McDargh is an associate member of the American Society of Civil Engineers and a member of the American Water Works Association. His private practice now occupies his entire attention and he recently resigned his position in the city waterworks.



HARRY J. M'DARGH, C. E., DAYTON, O.

Personal Notes.

Hon. George A. Proctor has been re-elected mayor, at Sarnia, Ont.

Frank B. Gridley has been appointed deputy city engineer, at Troy, N. Y.

Paul L. Schultze has been appointed county engineer of Oneida county, New York.

Col. Leopold Markbreit was inaugurated mayor of Cincinnati, Ohio, January 1.

Albert A. Everett has been appointed second assistant city engineer at Charleston, S. C.

Charles B. Pond has been appointed commissioner of public works, at Schenectady, N. Y.

J. A. Starrett, formerly assistant city engineer, at Canton, Ohio, has been appointed city engineer.

Theodore W. Sarver, borough engineer of North Braddock, Pa., died recently aged 48 years.

Hon. C. S. McCullough, mayor of Darlington, S. C., died January 18, of neuralgia of the heart.

A. B. Tracy has been re-elected chief engineer of the Consolidated Water Company at Utica, N. Y.

James B. Clow, president of James B. Clow & Sons, Chicago, Ill., died January 7, of pneumonia.

Harry T. Poe, Jr., has been elected city engineer and superintendent of water-works, at Americus, Ga.

Edward D. Rich has been appointed deputy city engineer, at Utica, N. Y., under Arthur O'Brien, city engineer.

F. Ridgeway, director of department of public works, Pittsburg, Pa., died December 31, of typhoid pneumonia.

George W. Tonson has been elected president of the board of public works, to succeed Oscar Sabin, at Toledo, Ohio.

J. W. Elims has been appointed superintendent of the new water purification works recently completed at Cincinnati.

Simeon P. Folsom, the first city engineer of St. Paul, Minn., died December 31, at his home in that city, aged 68 years.

Paul F. Rossell, of Wilmington, Del., has been appointed assistant engineer in the department of public works of Porto Rico.

Frank Doty, city engineer of Middletown, Ohio, and formerly county surveyor of Butler county, Ohio, died January 10, aged 50 years.

Wallace Greenalch has been reappointed commissioner of public works and Walter Melius has been appointed city engineer, at Albany, N. Y.

Samuel L. Cooper has been reappointed city engineer and R. E. Ferguson has been appointed commissioner of public works, at Yonkers, N. Y.

Charles Hermany, past president of the American Society of Civil Engineers, died at his home in Louisville, Ky., January 18, aged about 77 years.

H. L. Maddocks, formerly county engineer of Licking county, Ohio, has been appointed bridge engineer of Muskingum county, with headquarters at Zanesville, Ohio.

George V. Cresson, president of the George V. Cresson Co., Philadelphia, Pa., engineers and machinists, died January 18, at his country home near Philadelphia, aged 72 years.

John M. Brooks was elected mayor, John W. Flenniken chairman board of public works and William Brakebill and R. B. Ragsdale associate members of board of public works, at Knoxville, Tenn.

William Gillies, consulting engineer to the Illinois Steel Co., Chicago, Ill., was found dead on the street in that city January 20, and it is believed that he fell on the icy sidewalk and fractured his skull.

James W. Howard, consulting engineer on roads, streets and pavements, 1 Broadway, New York, who has devoted time for some years to military matters, has been promoted to be colonel in the National Guard.

Walter S. Morton, formerly of Hartford, Conn., and Wilmot W. Burritt have formed a partnership at 2 Rector street, New York City, for the practice of civil engineering, especially in water, sewers and reinforced concrete.

Charles E. Bolling was elected city engineer January 6, at Richmond, Va., to succeed the late W. E. Cutshaw. Mr. Bolling has been, for the last two years superintendent of water-works, and for 12 years previous to that was assistant city engineer.

George R. Stearns, director of public works, and George S. Webster, chief of the bureau of surveys, Philadelphia, Pa., sailed for England January 11, where they will study municipal sewage disposal plants in the interest of the city, and will later visit plants in France and Germany.

Myron H. Lewis and Clifford B. Moore, editors of "Waterproofing," announce that they have opened offices in the St. James Building, 1133 Broadway, New York city, where they will conduct a general consulting engineering business in waterproofing, foundations, hydraulics, and reinforced concrete.

George W. Rafter, M. Am. Soc. C. E., consulting engineer on water supply and power and on sewage disposal, died December 29, at Carlsbad, Austria, where he had gone recently from Rochester, N. Y., to regain his health. Mr. Rafter was born Dec. 9, 1851. Much of Mr. Rafter's professional work was in connection with water-works.

H. De Berkeley Parsons and Charles Sooysmith, consulting engineers, and Dr. L. W. Williams have been appointed to fill vacancies on the Metropolitan Sewerage Commission of New York, and Dr. George A. Soper and James H. Fuertes, who recently resigned from membership on the commission, have withdrawn their resignations at the request of Mayor McClellan.

Mr. F. K. Rhines, engineer, has become assistant to the treasurer and general manager of the General Fireproofing Co., Youngstown, O., assuming the new position January 1st. Mr. Rhines formerly was engineer with the East Iron & Machine Co., bridge builders, at Lima, Ohio, and more recently has been chief engineer and general manager of the Dixon Engineering & Construction Co., of Toledo, Ohio.

City engineers have been elected and re-elected as follows: H. J. Smith, Putnam, Conn.; Julius F. Frehsee, Lockport, N. Y.; Robert Gaw, North Bergen Township, N. J.; Kenneth Owen, Montclair Township, N. J.; Ernest Baechlin, Bloomfield Township, N. J.; Philip Prioleau, Jacksonville, Fla.; A. P. Smith, North Tonawanda, N. Y.; Albert A. Everett, Charleston, S. C.; J. W. Barnett, Athens, Ga.; James L. Light, Holyoke, Mass.; Ernest L. Boothby, Rensselaer, N. Y.; L. A. Washington, Paducah, Ky.; W. Thomas Wooley, Auburn, N. Y.; D. A. Hartwell, Fitchburg, Mass.; John Giles, Chicago, Ill.;

Clifford M. King, Sandusky, O.; Marsden Manson, San Francisco, Cal.; Harry G. Meiners, Covington, Ky.

Robert W. Hunt & Co., inspecting and Consulting engineers, have decided to establish a branch office and chemical laboratory in St. Louis, Mo., which will be under the charge of Mr. Charles W. Gennett, Jr. This gentleman graduated with the degree of Mechanical Engineer from Cornell Univerity in 1898, following which he was employed in the drafting room of the Baldwin Locomotive Works, and later in the inspecting and testing department of the Southern Railway Co. During the latter part of his connection with that organization he was in charge of their inspection work in Pittsburg and the west. Since then and up to the time of entering the service of Robert W. Hunt & Co., he has been the Western Sales Agent of the Atha Steel Casting Co. with headquarters in Chicago.

MACHINERY AND TRADE

Municipal Castings.

The Portsmouth Machine & Casting Co.'s plant occupies two entire blocks and the other two opposite corners of Third and Jefferson Sts., Portsmouth, Ohio. Being located upon the N. & W. Ry., the B. & O. S. W. Ry., the C. & O. Ry. and the Ohio River—prompt shipment at favorable rates can be made to all points.

While the plant is some 40 years old, the present company succeeded the old Portsmouth Foundry & Machine Works and consolidated with it the machine and foundry business of Simpson Bros. in 1907, and the consolidated companies represent an excellent and established line of municipal castings and probably as good a line of brick works' machinery as is made in the United States.

The present company has all the patterns and castings of both the original companies, which include dry and wet pans, presses, dies and all kinds of municipal castings and has a fine line of business in the way of molds, wheelbarrows, screens, etc.

Their line of municipal castings includes catch basins, radial or straight, sewer manhole covers, street drains, as well as plungers and other repairs for waterworks plants. They are fully equipped with a large foundry, pattern shop, mold and die departments, machine, blacksmith and forge shops and are equipped for steamboat work and repairing boilers. They are thus prepared to handle anything in these lines up to their daily capacity of 20 tons of iron.

One of their specialties is a piano wire clay screen, which, with their other brick machinery will be described later.

They solicit particularly correspondence from contractors and municipal officials regarding their line of paving, sewer and other municipal castings.

Corrugated Steel Culverts.

The Canton Culvert Company, of Canton, Ohio, manufacture what is claimed to be an advancement toward corrugated galvanized culvert perfection. First, the metal from which these culverts are made is a special analysis open-hearth stock differing in

ACME CULVERTS AS SHIPPED, BEING SET UP, AND COMPLETED.

chemical homogeneity from other steel or other metal culvert materials, heavily galvanized to prevent corrosion. Second, their strength or sustaining

power compared with regular corrugated culverts is considerably increased from the effects of a patented lateral flange-joint used in connecting along the center of the cylinder at both sides what may be described as opposite or upper and lower members

TEST OF A SECTION OF ACME CULVERT.

of the culvert proper. The flange snugly interlaps the corrugations and is rigidly held in place by galvanized bolts in alternating corrugations. Being manufactured in sections of uncommon style, these culverts can be shipped knock-down, nested, facilitat-

OVER FOURTEEN TONS ON FIVE SECTIONS OF ACME CORRUGATED METAL CULVERT.

ing delivery and reducing freight expense and the possibility of damage in transit to a minimum. This feature also is a convenience in cross-country transportation and makes it possible for agents and dealers to carry complete stocks for delivery on purchase.

Requests for culvert booklet and prices and detailed information regarding these culverts are solicited by the anufacturers.

A Level and Grade Finder.

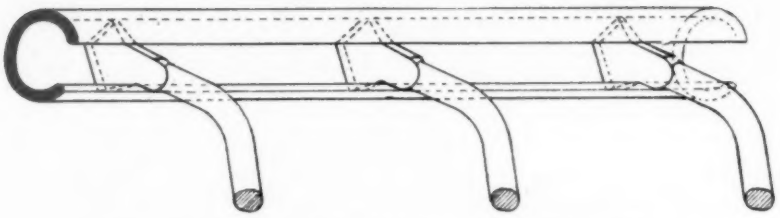
A combined level and grade finder is a very convenient tool for the engineer, architect, supervisor or track foreman, on the one hand and the mason, machinist, contractor, millwright or carpenter on the other. A very strong and reliable instrument of this sort is made by Edward Helb of Railroad, York County, Pa. It gives at a glance the true slant on any line or grade in degrees, inches and percentage at the same time, thus showing the exact distance out of a true level. It is specially adapted for the use of contractors engaged in laying pavements, cement sidewalks and sewers, building bridges, digging ditches and laying drains to grade, determining the fall of water, etc. Mr. Helb will on request send a circular describing the instrument and giving the opinions of those who have had experience with it regarding its value.

Protecting & Reinforcing the Wearing Surfaces of Concrete Curbing.

Concrete curbing when properly protected and reinforced is vastly superior to the best grades of stone and the attention of municipalities, in those sections of the country far removed from the stone quarries, has been, perforce, directed to its use for some time past, but within the last year or two even those municipalities in sections of the country adjacent to stone quarries have been forced to admit certain points of superiority of the steel protected concrete curbing over any form of natural stone curbing, and are using it in preference to stone.

Additional impetus has been given to its use by the appearance on the market of a new protection and reinforcement which is so simple that it is strange it has never before been used. The device consists of nothing more than lengths of steel in open tubular form held in place on the edge of the curb by steel bars imbedded in the concrete, the heads of which are drop-forged to fit the tube.

The tube itself is filled with concrete while on the form, which thereby locks the head of the reinforcing member into the tubular protecting member and at the same time transforms the hollow tube into a solid bar. The concrete filling on the inside of the tube joined to the concrete body of the curb, constitutes a key which binds the steel protecting edge directly with the mass of concrete throughout its length, and this too in addition to the



SECTION OF EDGE PROTECTOR FOR CONCRETE CURBING.

adhesion of the concrete to the outside of the steel tube itself and the reinforcing members heretofore mentioned, either of which in itself should be more than sufficient to hold the protecting edge in place.

The reinforcing members, three feet apart, extending backward and downward through the body of concrete, distribute throughout the mass the shock or thrust of any blow delivered upon the face of the protecting edge.

A simple device in the shape of a clamp easily removed is used to hold the tube rigidly in place until the concrete has set.

The manufacturers of this device, The Concrete Edge Protector Company of Detroit, Michigan, have been experimenting with this device for the past two years with the idea of assuring themselves of the best form for this tubular edge protection. Their patents cover all forms of tubes, whether circular, hexagonal, octagonal, triangular or square, but careful trials have convinced the manufacturers that the circular tube has all the strength and wearing qualities possessed by any other form, presents a more finished appearance when set in the curb, and has the added advantage of cheapness.

While the protection of the edges of concrete has in a way been accomplished for some years past, the Concrete Edge Protector Company has put upon the market a simple and cheap device which, while protecting the edge, at the same time reinforces the curb throughout.

CLAMP FOR HOLDING CONCRETE EDGE PROTECTOR DURING CONSTRUCTION.

Trade Publications.

The British-American Portland Cement Co., of Kansas City, Mo., has issued a very handsomely illustrated booklet entitled "The Span of Concrete" to show the advantages of the location of its plant at Nowata, Okla., and the great development of the cement trade, from which it expects to benefit when its mill has been completed.

The Murray Iron Works Co., Burlington, Iowa, issue their circular, Series D, No. 7, entitled "Nomenclature of Murray Corliss Engines, which shows their various forms of engines in perspective, in outline and in diagrams.

The January bulletin of the Universal Portland Cement Co., Commercial Bank Building, Chicago, Ill., is devoted to pictures of houses, buildings, sidewalks, irrigation and hydraulic structures in which Universal Portland cement has been isued.

The Briggs Labor Saving Specialty Co., Waterloo, Iowa, are distributing a calendar on four cards showing three views of their machine for sprinkling, sweeping and gathering stret dirt, which they claim reduces the cost of cleaning pavements fully 50 per cent., and one view of their 2-yard street city dump cart, which is balanced on one axle, is low down for loading, and is dumped by the driver on his seat.

The Trussed Concrete Steel Co., Detroit, Mich., are sending out letters calling the special attention of engineers and architects to their ribmetal as a steel reinforcing material for concrete for which they claim an excess of strength of 15 to 25 per cent. for the same weight over other forms of reinforcing metal.

"Technical Literature" has changed its name to "The Engineering Digest" and its index to current periodicals is now known as the "Technical Press Index." These changes do not indicate any change of policy but a desire to fit the names more nearly to the results of the work of the editors of the magazine. It is published by The Technical Literature Co., 220 Broadway, New York City.

"Tonindustrie Zeitung," Berlin, Germany, has issued its usual calendar for 1908, in pocketbook form, showing the days of special interests to the clay industry, with a series of descriptions of clay working apparatus and a trade directory in two supplementary volumes. The same company issues a "Beton-Taschenbuch on the same plan in two pocket sized volumes.

H. W. Clark, who is the president and general manager of the Mattoon, Ill., Clear Water Co., as well as the manufacturer of the Clark meter box, sent out New Year's greetings which called special attention to his concrete meter box manufactured on his new iron collapsible form and his new Teksagon meter coupling, both of which made good during 1907.

A. J. Ralph & Co., Indianapolis, Ind., are distributing circulars descriptive of the Hohn power tamped concrete brick machine.

McVean and Northup, consulting engineers, Grand Rapids, Mich., have printed in a neat booklet their report accompanying their plans for a sewerage system for Hastings, Mich.

Trade Notes.

ASPHALT.

Shawnee, Ok.—City council has passed resolutions authorizing the mayor, city engineer and purchasing committee to purchase an asphalt plant not to exceed $8,000.

Indianapolis, Ind.—Bids are asked until Feb. 12 for furnishing a municipal asphalt repair plant. Joseph T. Elliott, prest. B. P. W.

BRICK.

Crawfordsville, Ind.—The Poston Paving Brick Co. has re-elected officers for the ensuing year as follows: President, I. C. Elston; vice-president, James M. Waugh; general manager and treasurer, James M. Waugh; secretary, H. H. Ristine.

CEMENT.

Sandusky, O.—Special. The Sandusky Portland Cement Co. of Sandusky, Ohio, manufacturers of Medusa Waterproof Compound, report that that material was used in the following work: In a cement jacket on the 850,000 gallon concrete standpipe being built at Grand Rapids, Mich.; in the Tunnel Work at St. Paul done by the Twin City Rapid Transit Co.; in the Art Stove Co., and Bell Telephone Co., contracts at Detroit, Mich.; in a coal storage tank constructed by the Alger Coal Co., Alger, Wyo.; in a concrete tank for Turner Bros., brass works, Sycamore, Ill.; in a section of the concrete roof for the Chicago City Ry., Chicago, Ill., and by the C. M. & St. P. Ry. Co. in concrete construction work.

Bethlehem, Pa.—The Nazareth Cement Co. has announced that the mill will resume operations February 3, giving employment to 1000 or more men.

Harvey, Ia.—Special. Grading has been started on the two and one-half miles of terminals and four miles of mine connection track at the plant of the Hawkeye Portland Cement Co., Harvey, Iowa. The Freeborn Engineering & Construtcion Co., of Kansas City, Mo., are engineers and contractors.

Salem, Mass.—The Hadley-Gill Cement Co. has been incorporated to manufacture cement, with officers as follows: President, Albert H. Hadley, Lynn; treasurer and clerk, Michael J. McCafferty, Saugus.

Independence, Kas.—The Fidelity Portland Cement Co. has been organized.

Brooklyn, N. Y.—The American Hydrolith Co., of New York has been incorporated to manufacture flooring, cement, etc., by Wm. Otis Badger, Jr., Robert Van Iderstine, Wendell P. Barker, 100 William st., New York City.

Schenectady, N. Y.—The Crane-Veeder Co., has been incorporated to deal in lime, cement, etc., by Wm. S. Veeder, Thomas R. Crane, Ida M. Veeder, and Anna M. Crane.

Rochester, N. Y.—The Victor Gypsum Co. has been incorporated to mine and market gypsum rock and building material, by Chas. L. Tuttle, Allison Tuttle, Joseph W. Hart, of Rochester, and Howard G. Fisher, and L. Steiner, of Akron, N. Y.

Buffalo, N. Y.—The Niagara Gypsum Co., has completed its large mill at Oakfield, N. Y. The company's offices are located at 597 Michigan st., this city. Its officers are: President, John A. Kling, Cleveland, O.; vice-president, W. K. Squier, Syracuse, N. Y.; secretary and treasurer, M. A. Reeb, Buffalo.

The Association of Licensed Cement Manufacturers was formed Jan. 9 by the North American Portland Cement Co. and the companies which own its stock, The Alpha, American, Atlas, Lawrence, Lehigh and Vulcanite Portland Cement companies, together with the Catskill, Dexter, Edison, Nazareth, Penn-Allen, and Pennsylvania Portland Cement companies which have secured licenses under the Hurry and Seaman, Edison, Carpenter, and other patents controlled by the central holding company.

CONCRETE BLOCKS.

Hackettstown, N. J.—The Warren County bd. of Freeholders (Belvidere, N. J.), will purchase machinery for making concrete blocks, work to begin early in the spring.

Cleveland, O.—The Waterproof Cement Block Co. has been incorporated by W. F. Kehres, T. R. Teare, R. L. Palmer, W. P. Chard, and W. L. Eggers.

Bondville, Ill.—W. H. Scott has purchased machinery and will operate a concrete block plant.

Petoskey, Mich.—The Northern Lime Co., of Grand Rapids, has been organized by representatives of the Michigan, the Superior and the Elk Rapids companies, to prevent ruinous competition in lime, which it is claimed, has been severely felt during the last few months. The officers are; President, Homer Sly, of the Elk Co.; vice-president, Henry Zipp, of the Superior; secretary, Morgan Curtis, of the Michigan; treasurer, E. D. Conger, of the Michigan.

Nebraska City, Neb.—The Wilson Reinforced Concrete Co., has been incorporated by Charles H. Wilson, of Red Oak, Ia.; John J. Gilligan, Falls City, Neb.; Chas. H. Busch, of Avoca; Trenner Cone, of Wahoo. The officers of the company are: President, John J. Gilligan; secretary and treasurer, Chas. H. Busch. The company will have its headquarters in Omaha.

PURCHASE OF MACHINERY.

New York City.—Special. The National Association of Manufacturers, 170 Broadway, advises us that it has an inquiry from Europe for machines used in the production of paving stones and macadam.

Lima, Peru, S. A.—Special. John J. Clark desires information and prices on materials for repairing asphalt and asphalt block streets, and regarding treated wooden blocks, asphalt and asphalt block machinery.

Bloomington, Ill. — Special. The Davis-Ewing Concrete Co., 211 Unity Bldg., is in the market for a good dump wagon.

Kankakee, Ill.—Special. Joseph J. McCarthy advises us that he is in the market for a mould for silo blocks.

Sisseton, S. D.—Special. The Sisseton Stone Co., advises us that it is in the market for an engine and brick machine.

Springfield, Mo.—The purchase of brick testing machinery has been recommended by Mayor Blain.

Ann Arbor, Mich.—Street Commissioner Wisner suggests, in his annual report, the purchase of one or more two-horse wagons.

PURCHASE OF MATERIALS.

Lima, Peru, S. A.—Special. John J. Clarke desires information and prices on materials for repairing asphalt and asphalt block strets.

Sisseton, S. D.—Special. The Sisseton Stone Co. advises us that it is in the market for lime and cement.

Ann Arbor, Mich.—Street Commissioner Wisner says that about 2000 loads of gravel will be needed next spring for filling.

LIGHT, HEAT AND POWER.

Decatur, Ill.—The Vaughn Electric Co. is being organized here to conduct an electric business, by J. L. Vaughn, L. Cochran, and B. M. Rhoads.

Mansfield, O.—The Fairview Oil & Gas Co. has been incorporated by A. F. Porter, Michael Schneider, T. H. Patterson, Chas. A. Bangert, and M. W. Gaton.

MISCELLANEOUS.

Trenton, N. J.—The Berger Trap Rock Co. has been incorporated by M. F. Berger, of Raven Rock; F. Max Gress, Trenton; Anna L. Gress, Trenton; Geo. L. Berger, Raven Rock.

Cincinnati, O.—The Contractors' Stone & Gravel Co., has been incorporated by C. G. Nave, E. F. Gray, T. F. McClure, Theodore Cornelle, and C. E. Holley.

An interurban electric railroad connecting the well known watering ploces of Eldorado Springs and Monegaw Springs, Mo., and passing through the towns of Tiffin and Lowery, Mo., is well under way. The road will connect three existing steam roads and will open up a new and fertile valley which until now has not been fully developed, due to the lack of proper railroad facilities. The Freeborn Engineering & Construction Co., of Kansas City have been appointed as engineers.

Clinton, Ia.—This city has constructed 9-mis. of cement walks during the last year, more than was ever constructed in any previous year in the history of the city.

Columbia, S. C.—Fingal C. Black has been appointed resident representative of J. L. Ludlow, engineer in charge of the permanent street work in this city, and will have direct charge of street paving.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Champaign, Ill.—Paving is proposed for John st.

Oshkosh, Wis.—Paving is contemplated for several streets.

Houston, Tex.—Brick paving is contemplated for Capitol ave.

Batavia, Ill.—Paving is contemplated for Wilson and Main sts.

Hamilton, Ont.—Brick paving is contemplated for James and Barton sts.

Audubon, Pa.—The question of paving the streets may be voted on.

Opelousas, La.—Bids will be asked soon for constructing sidewalks.

Neenah, Wis.—Vitrified block paving is contemplated for Wisconsin ave.

Fond duLac, Wis.—Vitrified block pacing is contemplated for Wisconsin ave.

Dallas, Tex.—The property owners on Martin st. have asked for brick paving.

Ashtabula, O.—City council voted to pave Maple st. with asphalt. F. W. Wagner, clk.

Moberly, Mo.—Brick paving is contemplated for certain streets. S. McDonald, cy. engr.

Green Bay, Wis.—Broadway st. will be paved with asphalt next summer. Cy. Engineer Reed.

North Yakima, Wash.—About 17 blocks of Yakima ave. will be paved with asphalt or brick.

Little Rock, Ark.—Vitrified brick paving is contemplated for about 40 blocks of streets.

Springfield, Mo.—An ordinance has been passed providing for brick paving in Mill st.

Edinburg, N. D.—The construction of cement sidewalks is contemplated by the village board.

Charleston, W. Va.—Plans for paving Hansford st. will be prepared by W. A. Hogue, cy. engr.

Harrisburg, Pa.—An ordinance has been passed providing for sheet asphalt paving on Swatara st.

Santa Barbara, Cal.—Council has decided to order many street improvements. Elmer J. Boeseke, mayor.

New Orleans, La.—Carrollton ave., from St. Charles ave., to the New Basin, will be paved with asphalt.

Topeka, Kas.—Petitions are being considered for 38½ blocks of paving and 32 street intersections.

Springfield, O.—Asphalt paving is favored for S. Fountain ave. A number of streets will be improved.

Belleville, Ill.—Brick paving and curbing is contemplated for new streets. Fred Deutchman, Jr., cy. engr.

Louisville, Ky.—Vitrified brick paving is contemplated for 4th and Central aves. in South Louisville.

Watertown, Wis.—Bids will be asked soon for paving N. Church and Main sts, with brick. F. S. Weber, cy. clk.

Evansville, Ind.—Asphalt paving, laid over the existing brick pavement, is under consideration for Mai st.

Davenport, Ia.—The city engineer has been directed to prepare plans and specifications for paving Harrison st.

Covington, Ky.—Brick paving has been decided upon for 11th, 6th, 12th, Bremen, 5th, 18th, Trevor and 17th sts.

Sweetwater, Tenn.—Surveys and estimates for paving the streets will be made by T. J. Moreland, C. E., of Knoxville.

St. Louis, Mo.—The improvement of more than 13-mis. of streets has been unanimously agreed upon by the taxpayers.

Huntsville, Ala.—Council has passed an ordinance to pave Washington st. Paving is contemplated also for Jefferson st.

Charleston, S. C.—Granite block, macadam, brick and shell paving are contemplated for a number of streets next summer.

Mansfield, O.—The city engineer has been directed to prepare plans for paving certain streets with brick, sidewalks and curbing.

Lockland, O.—Plans and specifications for improving Stout st. with cement curbs and gutters have been submitted by A. Cowan, cy. engr.

Connellsville, Pa.—An ordinance has been passed providing for an election to vote on the issue of bonds for improving New Haven st.

Freeport, Ill.—The property owners on the south side are divided on the question of paving the streets with brick or macadam.

Stevens Point, Wis.—An ordinance is pending providing for the permanent improvement of Church st. between Mill and Division sts.

La Crosse, Wis.—Brick paving has been decided upon for Vine and 5th sts. and macadam for parts of Vine, 6th and Charles sts. this year.

Sycamore, Ill.—The board of local improvements is considering petitions for paving Exchange, California and Maple sts. with asphalt.

Los Angeles, Cal.—The board of public works contemplates converting Mission Road into a driveway connecting Main st. and Pasadena Boulevard.

Plymouth, Mich.—Plans and specifications for 1¾-mis. of brick and macadam paving in this town are being made by Riggs & Sherman, of Toledo, O.

Indianapolis, Ind.—A resolution has been confirmed providing for bitumineral paving in Butler ave., in Irvington, from Washingotn st. to University ave.

Salina, Kas.—Special. P. G. Wakenhut, cy. engr., says that resolutions have been passed for about 50,000-sq. yds. of paving. A. W. Godfrey, cy. clk.

Clinton, Ia.—Bids will be asked about March 1 for constructing 3000-sq. yds. of brick paving and 150,000-sq. ft. of cement sidewalks. Charles P. Chase, cy. engr.

San Francisco, Cal.—The question of issuing $35,000,000 bonds for repaving streets, constructing a fire protection system, fire houses and sewer system will be voted on.

Dayton, O.—An ordinance has been passed providing for brick, bituminous macadam, sheet asphalt, creosoted wood block, plain macadam or broken stone paving in Bacon and Jackson sts.

Watertown, N. Y.—City engineer Baker will prepare plans and specifications at once for paving LeRoy and Main sts. with Medina block on concrete base and vitrified brick on concrete base.

Chehalis, Wash.—Council has passed an ordinance and bids will be asked soon for paving about 9 blocks of streets in the business district with brick. Considerable macadam paving is also contemplated.

Buffalo, N. Y.—Special. F. G. Ward, comr. pub. wks. has been directed to prepare plans and ask for bids for paving Niagara st. from Hertel ave. to Cornelius Creek; Hoffman alley, from Hamilton st. to south end, with all kinds of material; Exchange st. from Hamburg st. to Indian Reservation line, dressed block Medina sandstone; Hamburg Turnpike, from bridge over Buffalo river to viaduct over Buffalo Creek R. R., block Medina sandstone; Louisiana st., from Perry to Miami sts., block Medina sandstone; Glenwood ave. from Masten to Purdy st., with all kinds of material. Common council contemplates macadamizing Saybrook Place, from Delaware ave. to Chapin Parkway.

Elkhart, Ind.—Plans have been completed for paving Franklin st. with brick.

Winchester, Ind.—Ordinances are pending providing for brick paving in a large number streets.

Newbern, Tenn.—Surveys are being made preparatory to constructing granolithic sidewalks.

Cortland, N. Y.—Bids will probably be asked soon for paving N. Main st. with asphalt or brick.

Zanesville, O.—The city engineer has been directed to prepare plans for paving McIntire ave.

Madison, Wis.—This city will expend about $60,000 for new macadam streets this year.

CONTRACTS TO BE LET.

Paoli, Ind.—Bids are asked until Feb. 4 for constructing gravel roads. Alvin B. Ham, co. audt.

Ottawa, O.—Bids are asked until Feb. 8 for constructing stone roads. J. T. Maidlow, co. surv.

Washington, Ind.—Sealed bids are asked until Feb. 4 for graveling a number of roads. Thomas Nugent, co. audt.

Madison, Ind.—Sealed bids are asked until Feb. 4 for constructing a macadam road. G. F. Crozier, co audt.

Terre Haute, Ind.—Bids are asked until Feb. 22 for constructing crushed stone roads in Honey Creek twp. Co. comrs.

Salt Lake City, Utah.—Sealed bids are asked until Feb. 21 for improving 1st South st. L. J. Kelsey, cy. engr.

Mt. Vernon, Ind.—Sealed bids are asked until Feb. 17 for constructing a gravel road. Harry W. Pisely, chmn. B. P. W.; Paul Maier, co. audt.

Dayton, O.—Bids are asked until Feb. 6 for constructing curb and gutter on Kiefer st. J. C. Ely, prest. B. P. S.

Manistee, Mich.—Bids are asked until Feb. 6 for paving Maple, Mason and Jones sts. C. A. Gnewuch, cy. clk.

Cadillac, Mich.—Sealed bids are asked until Feb. 11 for paving 22,110-sq. yds. George Johnson, clk. B. P. W.

Monticello, Ind.—Sealed bids are asked until March 3 for improving a stone road in Jackson twp. J. L. Ackerman, co. audt.

Charlotte, N. C.—Bids are asked until Feb. 11 for paving driveways. J. B. Spence, custodian U. S. Post Office and Court House.

Madison Barracks, N. Y.—Bids are asked until Feb. 15 for constructing 6000-sq. ft. of concrete sidewalk. Lieut. R. W. Drury, constr. Q. M.

New Albany, Ind.—Sealed bids are asked until Feb. 6 for improving a public highway in Georgetown twp. Julian T. Miller, co. audt.

Muskegon, Mich.—Bids are asked until Feb. 15 for furnishing crushed limestone or fieldstone. John B. Barlow, clk. bd. road comrs.

Washington, Pa.—Sealed bids are asked until Feb. 6 for repairing, restoning and resurfacing 8-mis. of roads. Wm. Wylie, co. road engr.

Ft. Williams, Me.—Sealed bids are asked until Mar. 2 for grading here. Capt. F. J. Morrow, constr. Q. M., 478½ Congress st., Portland.

Brookville, Ind.—Sealed bids are asked until Feb. 4 for constructing gravel roads in Ray and Laurel twps. Chas. A. Miller, co. audt.

Santa Monica, Cal.—Bids are asked until Feb. 15 for 2000-sq. yds. of asphalt paving on concrete base, curb, etc. Thomas H. James, cy. engr.

Tiffin, O.—Bids are asked until Feb. 8 for constructing a wood block floor and sidewalk on Washington st. bridge. R. R. Bour, co. audt.

Pittsburg, Pa.—Bids are asked until Feb. 10 for furnishing 38,000-tons of ballast and screenings. Geo. T. Barnsley, ch. road engr., 26 Court House.

Nashville, Tenn.—Bids are asked until Feb. 10 for paving, riprap, excavation, etc., at Colbert Shoals Canal, Riverton, Ala. Wm. H. Harpe, major engrs.

Rockville, Ind.—Sealed bids are asked until Feb. 6 for constructing certain gravel roads. T. A. Garrard, chmn. co. comrs.; H. A. Henderson, co. audt.

Fayetteville, Tenn.—Sealed bids are asked until March 2 for grading and constructing 4 to 5 mis. of asphalt or concrete sidewalks. D. M. Goodner, mayor.

Terre Haute, Ind.—Sealed bids are asked until Feb. 22 for grading and paving with crushed stone 2-mis. and 415-ft. of the Lockport road. Nathan G. Wallace, co. audt.

Columbus, Ind.—Sealed bids are asked until Feb. 4 for constructing 1-mi. and 2192-ft. of road in Union twp. W. O. Clark, chmn. co. comrs.; John M. Davis, co. audt.

Aberdeen, Wash.—Sealed bids are asked until Feb. 19 for 5100-cu. yds. of dyking, and 1,458,200-cu. yds. of filling in certain streets, alleys and lots. P. F. Clark, cy. clk.

Bedford, Ind.—Sealed bids are asked until Feb. 10 for constructing gravel and macadamized roads in Marion and Spice Valley twps. Anselm Wood, chmn. co. comrs.; Walter G. Owen, co. audt.

St. Louis, Mo.—Sealed bids are asked until Feb. 11 for reconstructing and improving a number of streets with granite block, vitrified brick, and bitulithic. A. J. O'Reilly, prest. B. P. I.

North Olean, N. Y.—Sealed bids are asked until Feb. 13 for 16,000-sq. yds. of brick paving on concrete base, with curbing, street inlets and other work and accessories. Cornelius Sullivan, prest. bd. trustees.

Billings, Mont.—Sealed bids are asked until 8 p. m. Feb. 4 for 6305-sq. yds. of shale brick paving, and 86,543-sq. yds. of gravel macadam paving, 17,400-lin. ft. gutter, sewers, etc. J. D. Matheson, cy. clk.

Buffalo, N. Y.—Sealed bids are asked until Feb. 5 for repaving S. Michigan st. and paving Empire, Peckham and Gibson sts. and Crescent ave. with each kind of pavement according to specifications. F. G. Ward, comr. pub. wks.

Youngstown, O.—Sealed bids are asked until Feb. 17 for constructing a creosoted wood block floor and steel joists on the Lanterman Falls bridge on the Youngstown and Canfield road in Youngstown twp. Will B. Jones, co. audt.

Erie, Pa.—Sealed bids are asked until Feb. 4 for State st. extension, consisting of the construction and completion of a public steamboat landing at the Port of Erie about 548-ft. long and 100-ft. wide, including dredging, timber, cribs filled with rock, filling between cribs, concrete walls and brick pavement. M. H. Taylor, chmn. Erie Dock Comn.; H. T. Leasure, secy.

CONTRACTS AWARDED.

Muskogee, Ok.—The Stuckey Construction Co. was awarded the contract for paving 2 streets on the east side.

Machias, Wash.—Fred Gemmer was awarded the contract for constructing 4½-mis. of the Happy Hollow road, for $6635.

Detroit, Mich.—The contract for constructing sidewalks was awarded to the Artificial Stone Sidewalk Co. at 10 cts. a sq. ft.

Jacksonville, Fla.—The contract for macadamizing 17,600-sq. yds. of road was awarded to Foster & Long, at 84 cts. a sq. yd.

Chattanooga, Tenn.—The West Construction Co. secured contracts, Jan. 7, for paving in districts Nos. 5 and 13, for about $1300.

Boulder, Colo.—The contract for constructing and repairing 1 2-3-mis. of wagon road was awarded ot Henry Johnson, of this city.

St. Paul, Minn.—Grading contracts were awarded Jan. 2 as follows: Louisa st., Ryan & Johnson, $2219; Ocean st., Thornton Bros., $583.

New York City.—D. W. Moran, 562 Burnside ave., was awarded the contract for paving Burnside ave., Bronx Boro, with granite blocks, for $47,599.

Dallas, Tex.—The General Supply & Construction Co. was awarded the contract for paving S. Akard st., Jan. 17, with brick, at $2.06 a sq. yd.

Pine Bluff, Ark.—The contract for constructing several miles of paving in this city was awarded to Petty & Shelby, of Little Rock, for $30,000.

Waterford, Pa.—The contract for constructing brick and macadam paving in this borough and township was awarded to W. C. McIntyre & Sons, of Sharon.

Baltimore, Md.—The Filbert Paving & Construction Co., Penn. Bldg., Phila., was awarded the contract for paving Konig st. with asphalt, for $3000.

Guthrie, Ok.—I. P. Shelby was awarded the contract, Jan. 13, for paving an alley between Main and Scott sts., from 5th to 6th, with vitrified brick, for $1500.

Goshen, Ind.—W. W. Hatch & Sons, of this city, secured the contract for constructing two roads between Hammond and Tolleston for $6799 and $6199 respectively|

Ridgefield, Conn.—The contract for constructing 9750-ft. of gravel road on the Salem road was awarded to Bennett N. Beard & Co., of Shelton, Conn., at $1 a lin. ft.

Buffalo, N. Y.—Special. The contract for paving Lewis st. with Medina block stone, from Clinton to Howard sts., was awarded to F. V. E. Bardol, 400 D. S. Morgan Bldg., for $29,900.

Washington, D. C.—The Wise Granite Co., Wise, N. C., was awarded the contract for furnishing 12,000-ft. of straight granite curbing at 90 cts. a ft. and 1500-ft. of curved curbing at $1.30 a ft.

Springfield, Ill.—The contract for paving Spruce st. between 1st and 2d, with brick was awarded to Henry Nelch, at $1.48 a sq. yd. and 50 cts. for curbing, and for an alley, from 9th to 10th, between Adams and Washington, at $1.'0 a sq. yd.

Indianapolis, Ind.—Contracts for street improvements were awared, Jan. 27, as follows: 24th st., from Meridian to Talbot ave., bitulithic, Hoosier Construction Co., $3.61 a ft.; $1.25 for sewer connection, $5 each for gas connections; 24th st. from Talbot to Central aves., asphalt, Union Asphalt Construction Co., $3.19, $1 for water connections, $1 for sewer connections, $5 each for gas connections; 1st alley north of 14th st., from Illinois to Lafayette sts., brick, L. J. Cooper & Co., $1.47; Northwestern ave. from 32nd to 36th sts., bitulithic roadway with brick gutters, Hoosier Construction Co., $4.38, $1.25 for sewerage connections, $1 for water connections, $5 each for gas connections; Maryland st., from State to Parkside, cement walks, Marion Caldwell, 70 cts., a ft.; Union st. from Tabor to Kelly, grading, August Benzinger, $1.25.

SEWERS.

Tyler, Tex.—The Tyler Sewer Co. has been incorporated by W. G. Cain, Ben. B. Cain, L. L. Jester, and C. W. Kouns.

CONTEMPLATED WORK.

Kingman, Kas.—A new sanitary sewerage system is contemplated.

Virden, Ill.—A sewerage system is contemplated. Mayor Motley.

Portland, Ore.—Plans for a sewerage system for Sellwood have been submited.

Cliff, Wash.—Plans have been formulated for constructing a sewerage system.

Ambler, Pa.—Plans are being made for installing a sewerage disposal plant.

Ashtabula, O.—The construction of storm sewer in Columbus st. is proposed.

Bath, Me.—Plans for a sewerage system will be submitted soon. G. E. Hughes, mayor.

Carrollton, Ill.—The question of constructing a sewerage system is under consideration.

Ames, Ia.—Plans for a sewerage system for the West Side will be made by city engineer McDonold.

East Rutherford, N. J.—This borough voted, Jan. 14, to construct a complete sewerage system.

Aurora, Minn.—The question of issuing bonds for constructing a sewerage system will be voted on.

Wilkesbarre, Pa.—Plans for constructing sewers during 1908 are being prepared by cy. engr. Hand.

Trinidad, Colo.—Plans for a sewerage system for this city are being made by F. O. Ray, of Pueblo.

College Hill (Cincinnati P. O.), O.—Voted to issue $45,000 bonds for constructing a sewerage system.

Beaver, Pa.—Will vote on the issue of bonds for constructing a sewerage system. Harry J. Boyd, boro secy.

Stoughton, Wis.—Plans for a main sewer 7 or 8-mls. in length, are being made by L. A. Wheeler, cy. engr.

Herkimer, N. Y.—The question of improving the sewerage system is being considered by the village trustees.

Charleston, W. Va.—Bids will be asked soon for constructing a 12-in. sewer in Hansford st. W. A. Hogue, cy. engr.

Fenton, Mich.—Plans for a sanitary sewerage system are being prepared by the Riggs-Sherman Co., of Toledo, Ohio.

Moberly, Mo.—Bids will probably be asked in March or April for constructing pipe sewers. J. F. Curry, cy. clk.

Boise, Idaho.—The construction of a pipe lateral sewer in dist. No. 107 is contemplated. F. A. Tolman, cy. engr.

Carthage, O.—Village council is considering plans for constructing a sewerage system, at a cost of about $100,000.

Havana, Ill.—A hearing will be held Feb. 3 to consider the question of establishing a new drainage district in Mason county.

Yorkville, S. C.—Surveys for constructing a sewerage system will be made at once by G. E. Shand, C. E., of Columbia, S. C.

Quincy, Ill.—Plans are being prepared for the extension of the North End sanitary sewer system. Fred L. Hancock, cy. engr.

Webb City, Mo.—Voted Jan. 7, to issue $17,000 bonds for constructing an outfall sewer in Madison st. W. E. Smith, cy. engr.

Binghamton, N. Y.—John A. Giles, cy. engr., will begin, Feb. 1, outlining plans for the proposed new sewer and street work.

Marinette, Wis.—Plans for the construction of sewers in Sherman ave. and Josephine st. are being made by L. B. Hillis, cy. engr.

Covington, Ia.—Town council contemplates the purchase of 4000-ft. of 6, 8 and 10-in. sewer pipe to be laid in the business section.

Ellwood City, Pa.—Plans for constructing an intercepting sewer and sewage purification will be prepared by R. W. Pratt, of Columbus, O.

Pasadena, Cal.—Will vote Feb. 20 on the question of issuing $100,000 bonds for improvements to the sewerage system on the east side and the municipal electric light plant.

Audubon, Pa.—The Board of Trade has presented a petition to councils asking that the question of issuing bonds for sewerage and water-works systems be voted on.

Wyoming, O.—The village councils of Hartwell, Lockland and Wyoming are considering the advisabilty of constructing a tri-city sewerage system, with a disposal plant.

Chattanooga, Tenn.—A resolution was passed Jan. 21 directing the bd. of pub. wks. to build the proposed Chestnut st. sewer in accordance with plans already prepared.

Dallas, Tex.—The sum of $75,000 has been appropriated for the improvement of this city's sanitary sewerage system. D. F. Sullican, w. w. & sewer comr.; S. J. Hay, mayor.

Fairview, (Detroit P. O.), Mich.—The city council has decided that the sewerage system is inadequate and the question of constructing a new one is under consideration.

Albany, Ga.—The bids submitted Jan. 6 for the purchase of $75,000 bonds have been rejected, and an additional $25,000 will be voted, and the whole amount sold later.

Indianapolis, Ind.—Blaine Miller, cy. engr., estimates the cost of converting Pogue's Run into a great sewer at $750,000. Preliminary plans for the work have been completed.

Gouverneur, N. Y.—The state health department has recommended to the village trustees the construction of a sewage disposal plant and sewerage system, at a cost of about $75,000.

Laurel, Md.—The Laurel Improvement Assoc. has recommended to the mayor and city council that the State legislature be petitioned for permission to issue $35,000 bonds for constructing sewers.

Toronto, Ont.—The works committee concurred, Jan. 17, in the recommendation of the bd. of control to build an overflow sewer in University ave. and across to the Don to relieve the present sewers.

Vicksburg, Miss.—Preliminary surveys for constructing a sewerage system have been completed and the question of issuing $250,000 bonds for installing the system has been favorably voted on. Henry Trowbridge, cy. clk.

Mullan, Idaho.—The board of trustees passed an ordinance, Jan. 4, providing for the construction of a sewer system 16,000-ft. in length, at a cost of $12,000. Plans and specifications have been prepared and approved, and the work of construction will begin next spring.

Kansas City, Mo.—Mayor Beardsley has announced his intention to enter into correspondence with expert engineers to make plans for enlarging and improving the sewerage system. The estimated cost of the work is from $5,000,000 to $7,000,000. A septic sewage disposal plant is favored.

Buffalo, N. Y.—Special. The health commissioner has recommended the construction of a sewer in the north side of Abbott road, between the D. L. & W. R. R. and Payson st. The construction of a sewer in Sunnyside Place, between Hertel and Holmes aves. is also proposed. Harold J. Balliett, cy. clk.

Philadelphia, Pa.—Plans for a sewerage system which will relieve the towns and boroughs bordering on this city of sewage and waste are under

consideration. Darby, Colwyn, Yeadon, Lansdowne, Upper Darby, Clifton Heights, Aldan, Collingsdale, Sharon Hill, Glenolden, Norwood and Prospect, representing about 30,000 inhabitants, have been emptying their sewage into Cobb's and Darby Creeks. As a result the streams are now, with this city's help, about 50 per cent. sewage. The board of health says this condition will only be tolerated until a system of disposal can be put into operation.

CONTRACTS TO BE LET.

Crookston, Minn.—Bids are asked until April 6 for constructing ditch No. 72. Co. bd.

Appleton, Wis.—Bids are asked until Feb. 4 for for constructing sewers. E. L. Williams, cy. clk.

Estherville, Ia.—Bids are asked until Feb. 27 for constructing ditch No. 26. Roy J. Ridley, co. audt.

Austin, Minn.—Bids are asked until Feb. 7 for constructing 3600-ft. of 24-in. pipe sewer. T. M. Foster, cy. audt.

Redwood Falls, Minn.—Bids are asked until Feb. 18 for constructing tile and open ditch No. 7. L. P. Larson, co. audt.

Emporia, Kas.—Bids are asked until Feb. 17 for an extension of the storm water on Neosho st. G. O. Mathewson, cy. clk.

Clinton, Ia.—Bids will be received about March 1 for constructing 13-mis. of tile sewers. Chas. P. Chase, cy. engr.

Gladstone, Mich.—Bids are asked until Feb. 3 for constructing 250-ft. of piping from sewer outlet. W. A. Narracong, cy. clk.

Irvington, N. J.—Sealed bids are asked until Feb. 4 for constructing a pipe sewer in Lyon ave. M. Stockman, town clk.

Jefferson, Ia.—Sealed bids are asked until Feb. 7 for constructing county drains Nos. 33 and 10. E. S. Gore, chmn. bd. supvrs.

Billings, Mont.—Sealed bids are asked until Feb. 4 for constructing 3000-ft. of sewer, 12 manholes, 15 catch-basins, etc. J. D. Matheson, cy. clk.

East Liverpool, O.—Sealed bids are asked until Feb. 3 for constructing concrete storm sewers in Daisy and Sycamore alleys. A. S. Hughes, clk. B. P. S.

Hamilton, O.—Bids are asked until Feb. 18 for constructing the big Crawford's Run sewer and ditch, of brick and concrete. Joseph H. Brate, co. audt.

Tecumseh, Mich.—Bids are asked until Feb. 4 for constructing 55,769-ft. of 15, 10, 8 and 6 in. pipe sewers, with manholes, flushtanks, masonry and Y branches. W. L. Jones, clk. bd. village trustees.

Hattiesburg, Miss.—Bids are asked until Feb. 10 for constructing 2090-ft. of 12-in., 125,150-ft. 8-in. sewer, 7 flush tanks, 900-cu. yds. excavation, 45,000-ft B. M. foundation lumber, 26400-lin. ft. 15-in., 8550-lin. ft. 10-in. sewer, 90-manholes, 20-cu. yds. concrete masonry, 140,000-ft. B. M. sheeting left in trench. J. H. Putnam, cy. engr.

Seattle, Wash.—Sealed bids are asked until Feb. 8 for constructing a sewer in Green Lake dist. as follows: 795 lin. ft. 36-in. brick sewer; 3,721 lin. ft. 48-in., 5,023 lin. ft. 54-in., 336 lin. ft. 72-in., 1,104 lin. ft. 84-in., 2,050 lin. ft. 90-in., 2,132 lin. ft. 96-in. brick or concrete sewer; 3,482 lin. ft. 90-in., 103 lin. ft. 126-in., 6,948 lin. ft. 138-in. brick or concrete sewer with brick invert; 3,581 lin. ft. 72-in. brick or brick and concrete tunnel; 75 manholes; 300 cu. yds. 1:12 and 2,000 cu. yds. 1:8 extra concrete; 10,000 lin. ft. 8-in. sub-drain; 20,000 lbs. extra steel; 300 cu. yds. 6-in. side connections, etc. E. B. Bagley, secy. B. P. W.

Auburn, N. Y.—Sealed bids are asked until March 17 for constructing sewers and appurtenances and a disposal plant. The sewers will consist of 14,700-ft. of 8-in., 11,300-ft. 10-in., 6000-ft. 12-in., 3600-ft. 15-in., 300-ft. 18-in. and 1250-ft. 20-in. pipe. The excavation varies in depth from 5 to 18-ft. and will approximate 16,000-cu. yds. partly in solid rock. There will be 17,000-ft. 5-in. vitrified tile for house connections to be laid from the main sewer to the curb line. In the main trench and underneath the main sewer, as ground water demands, will be subsoil drains as follows: 20,000-ft. 4-in., 6000-ft. 6-in., 7000-ft. 8-in., 2000-ft. 10-in., and 200-ft. 12-in. All of the subsoil drain tile is to be of vitrified tile known as seconds; 84 manholes; 12 flushtanks; 12 lampholes. The disposal works will be of reinforced concrete, septic tanks and contact beds, and automatic appliances. J. S. Hanlon, cy. clk.

CONTRACTS AWARDED.

Mitchell, S. D.—George W. Austin secured the contract for constructing the south side sewer, for $3,300, Jan. 18.

Dallas, Tex.—George S. Vivian submitted the lowest bid, Jan. 20, for constructing a storm sewer in S. Akard st.

Elgin, Ill.—John A. Logan was awarded the contract for constructing a sewer in W. National and Walnut sts., Jan. 8, for $2483.

Bakersfield, Cal.—Glass & Fisher secured the contract, Jan. 7, for constructing a main and outfall sewer system, $53,780.

Crawfordsville, Ind.—The contract for constructing the Joseph H. Gray public ditch awarded to Henry K. Lee of New Richmond, Ind.

Salt Lake City, Utah.—J. D. Hamley was awarded the contract for constructing sewer extension No. 191, at $1.76 a lin. ft. or $16,074.88.

Santa Barbara, Cal.—The contract for constructing a large number of sewers, 19 manholes, 15 lampholes and 2 flushtanks was awarded to M. Strupelle.

Los Angeles, Cal.—The contract for constructing a vitrified pipe sewer in Spring and 9th sts. was awarded to A. P. Pusich, for $17,000, and the contract for pipe sewers in Bryan and 7th sts. was awarded to R. F. Ware for $9575 and $2420 respetcively.

St. Paul, Minn.—The contract for constructing the Warrendale sewer system, consisting of 5-mis. of sewer near Como Lake, was awarded, Jan. 18, to the General Contracting Co., for $49,765. Ryan & Johnson secured the contract for building a sewer in Duchess st. for $2773.

Youngstown, O.—The contract for constructing section No. 2 of Mahoning ave. sewer was awarded to John Grady, Jan. 11, for $13,102, and the contract for the section extending from the city limits to the bridge over Mill Creek was awarded to Gartland Bros. for $12,701.

Louisville, Ky.—The contract for constructing section B of the Southern outfall sewer was awarded to T. B. Jones & Co., of this city and Baltimore, for $296,524.15. The sewer pipe will be of reinforced concrete. The contract for constructing section B of the Beargrass intercepter sewer, 400-ft. in length, was awarded to Henry Bickel & Co., for $3900.

Canton, O.—The contract for constructing sewers in E. 4th, Young, Rowland and Gibbs sts., was awarded Jan. 3 to John Skeels, of this city, as follows: 1,335 ft. 36-in. brick sewer, $1.50; 80 ft. 12-in., 54 cts.; 935 ft. 15-in., 53 cts.; 1,230 ft. 18-in., 77 cts.; 740 ft. 20-in., 91 cts.; 980 ft. 24-in., $1.35; 46 catch basins, ea. $15; 13 pipe sewer manholes, ea. $17; 5 brick sewer manholes, ea. $9; total cost, $6,441.

Oakland, Cal.—Contracts for constructing sewers were awarded Jan. 4, as follows: John Geary, sewer in East 16th st., from Sixth to Seventh aves.; to Michael Murphy, sewers in Hillside ave., south of Linda ave., in College ave., from Vicento to Claremont ave., in 41st st., east of Telegraph st.; to Louis Lima, sewers in East 14th st., west of 15th ave., and in Clinton st., from Spring st., to East Summit ave.

Washington, D. C.—Bids were submited Jan. 15 for constructing sewers in the District of Columbia, as follows: (A) R. J. Beall Construction Co., Washington; (B) E. G. Gummel, 300 Rhode Island ave., N. W., Washington; (C) Warren F. Brenizer Co., Second and O sts., S. E., Washington. Ordinary excavation, (A) 83 cts. per cu. yd.; (B) 60 cts.; (C) 78 cts.; sewer brick masonry, (A) $16; (B) $14; (C) $15; 15-in. diameter sewer pipe, (A) 97 cts.; (B) 69 cts.; (C) 92 cts.; 12-in. pipe, (A) 85 cts.; (B) 55 cts.; (C) 80 cts.; 10-in. pipe, (A) 80 cts.; (B) 48 cts.; (C) 65 cts.

WATER WORKS.

Staatsburg, N. Y.—The Staatsburgh Water Co. has been incorporated to supply water, by Harry C. Barker, J. G. Bodenstein, George Kidder and others.

Bristol, Tenn.—This city will have a new water supply early in February. A new water main is being built from the city to the Henry Preston Springs, 6-mls. east.

CONTEMPLATED WORK.

Sharon, Pa.—The Sharon W. W. Co. will install a pump.

Andrews, Ind.—A water-works system is contemplated.

Frazee, Minn.—A water-works system is proposed.

Verona, N. J.—Voted to issue bonds for constructing a water-works system.

Carthage, Mo.—The establishment of a water-works system is contemplated.

Estelline, S. D.—Voted to issue bonds for constructing a water-works system.

Rossville, Ill.—Voted to issue bonds for improving the water-works system.

Mazeppa, Minn.—The installation of a new water-works system is being considered.

Dallas, Tex.—Plans are being considered for the proposed new pumping station.

Hugo, Ok.—Will vote on the issue of bonds for constructing a water-works system.

Lawton, Ok.—Bids will be asked soon for constructing a water system in the 5th ward.

Lafayette, Ga.—Bids will be asked about May 1 for constructing a water-works system.

Grants Pass, Ore.—The question of a municipal water-works system may be voted on.

Evansville, Ind.—The question of installing a filtration system is again being considered.

Ashkum, Ill.—The village bd. is considering the question of constructing a water-works system.

Brewster, N. Y.—About $30,000 will be expended on the water-works. Richard Miller, vil. clk.

Audubon, Pa.—The Board of Trade has petitioned councils to issue bonds for installing a water-works system.

Blandford, Mass.—Bids will probably be asked in April or May for constructing a water-works system.

Pine River, Minn.—The village council is considering the issue of bonds for a water-works system.

Westfield, N. Y.—In his annual report Mayor Augustus G. Alters recommends that this town build and own its own water-works.

Waukegan, Ill.—The citizens voted against the proposition to improve the water supply by means of a filtration plant.

Fort Worth, Tex.—Plans for constructing a water-works system have been submitted. E. C. Woodward, cy. engr.

Binghamton, Tex.—Voted to issue bonds for constructing a water-works system. Dr. Geo. B. Stewart, mayor.

Cincinnati, O.—An ordinance has been passed to issue bonds for constructing, improving and extending the new water-works system.

Winthrop, Mass.—The town bd. has authorized the issue of $134,000 bonds for the purchase of the plant of the Revere Water Co.

Lidgerwood, N. D.—Voted to issue bonds for drilling an artesian well and other improvements. F. W. Mashek, cy. audt.

Jefferson, O.—An ordinance has been passed providing for the issue of $40,000 bonds for constructing water-works.

Watuppa (Fall River P. O.), Mass.—The Watuppa water bd. contemplates constructing a reinforced concrete reservoir. P. D. Borden, cy. engr.

Columbus, O.—The Board of Public Service has authorized an expenditure of $20,000 for extending water mains. Henry C. Maetzel, cy. engr.

Lanett, Ala.—City council has decided to install a water-works system, and a committee has been appointed to ascertain the cost.

Canandaigua, N. Y.—This city contemplates 2 power pumps connected to a tandem compound Corliss engine. G. R. Ellis, supt. W. W.

Gloucester City, N. J.—The construction of water mains in E. Brown, E. Bergen, Chambers, Gaunt, Somerset, Catherine and Francis sts. is contemplated.

Cincinnati, O.—The board of public service adopted a resolution Jan. 20

providing that no new service should be installed or connected except by meter.

Anderson, Ind.—Council voted, Jan. 10, to purchase new force pumps for the city water-works plant to replace the present pumps. Mayor Terhune.

Grand Rapids, Mich.—This city contemplates remodeling the pumping station and installing a pumping engine and stand-pipe. A. Freshney, genl. mgr., B. P. W.

Augusta, Ga.—Nisbet Wingfield, comr. pub. wks., in his annual report recommends the construction of another reservoir, and the installation of a steam pump at the river.

Oakland, Cal.—Plans have been submitted to the bd. of pub. wks. by the People's Water Co. for constructing a reserve pumping station at the foot of 4th ave., East Oakland.

San Francisco, Cal.—Plans and specifications have been prepared for the proposed salt water supply. The plans provide for 3 reservoirs, 2 pumping stations, 90-mis. of pipe, 2 fresh water stations, etc.

Portsmouth, O.—The water-works comn. submitted a preliminary report to councils Jan. 8, recommending Tygart Bar water as the most feasible for a water supply, and stating that a new pumping station will have to be built.

Youngstown, O.—The cost of the proposed Berlin reservoir, which calls for a 50-ft. reservoir including a dam to impound 5,400,000,000-gals. of water, land, and raising county roads, is estimated by F. M. Lillie, cy. engr., at $400,000.

Briarcliff, N. Y.—A. J. Provost, Jr., cons. engr., 39 W. 38th st., New York City, and Chambers & Hone, cons. engrs., 15 William st., N. Y. City, have been appointed appraisers in the proceedings to municipalize the plant of the Briarcliff Water Co.

Council Bluffs, Ia.—Plans and specifications for a municipal water-works plant were submitted to the city council Jan. 13, by city engineer Etnyre. The cost of the proposed plant, including extensions to residence districts now without water service eliminated, is estimated at $616,902.

Plainfield, N. J.—The Plainfield engineering committee filed an exhaustive report, Jan. 10, explaining at length its findings and showing maps of the present source of the water supply and facts and figures as to the probable cost of erecting and maintaining a municipal water plant.

Paterson, N. J.—At a preliminary meeting of the members of the board of finance of the board of works, Jan. 16, a committee, consisting of Mayor McBride, finance commissioner Berdan, commissioner McCrystal of the board of works, city engineer Harder and city counsel Merrey, was appointed to make a thorough investigation of the water supply situation and decide upon the best plan to be followed by this city when the present contract between the city and the Passaic Water Company expires, in 1910.

Trenton, N. J.—Morris R. Sherrerd, of Newark, cons. engr. to the State Water Supply Commission, submitted to Judge Wm. M. Lanning, Jan. 14, plans for supplying this city and its vicinity with pure water, recommending erection of a storage reservoir between Rosedale and Pennington, with Stony Brook as the principal feeder. As planned the reservoir would have a water surface of 4 1-3-mis. and a drainage of 34-sq. mis. It would be 170-ft. above the sea level, and water would be brought through a tunnel 9000-ft. in length and a 4-ft. pipe 37,000-ft. in length. Judge Lanning represents a committee of citizens appointed by ex-Mayor Gnichtel to investigate probable causes of the typhoid epidemic in this vicinity.

Buffalo, N. Y.—Special. Francis G. Ward, comr. pub. wks., has asked the common council for permission to lay water mains in Mendota and School sts., and Crescent, Norwalk and Lorraine aves. The immediate purchase of a site for a water tower in the Kensington district is urged.

CONTRACTS TO BE LET.

South Bend, Ind.—Bids are asked until Feb. 12 for 250 to 750-tons of c. i. pipe. A. J. Hammond, cy. engr.

Montreal, Que.—Tenders are asked until Feb. 20 for furnishing a 12,000,000-gal. pump. Supt. Janin, of water com.

Washington, Ia.—Bids are asked until Feb. 17 for constructing a deep well near the water-works plant. John H. Steck, cy. clk.

Ft. Morgan, Ala.—Sealed bids are asked until Feb. 14 for the extension of the water distribution system. Capt. Louis F. Garrard, constr. Q. M.

Madison Barracks, (Sacketts Harbor P. O.), N. Y.—Bids are asked until Feb. 15 for constructing a 300,000-gal. steel tank. Lieut. R. W. Drury, constr. Q. M.

Berrien Springs, Mich.—Sealed bids are asked until Feb. 10 for constructing a water-works system. Loren B. Marquissee, vil. clk.; A. J. Hammond, cons. engr., South Bend, Ind.

CONTRACTS AWARDED.

Rainier, Ore.—The contract for constructing a water-works system was awarded to Giebish & Joplin, for $20,336.

Tacoma, Wash.—The contract for constructing water mains in dist. No. 528 was awarded to John Galluci, for $1473.

Fond du Lac, Wis.—Henry J. Immell was awarded the contract for constructing the intake for the city pipe line, for $1186.

Sauk Rapids, Minn.—The contract for constructing a new water-works system was awarded to James Kennedy, of Fargo, N. D., for $20,885.

Homer, La.—The contract for constructing a water-works system was awarded to the O'Neill Engineering Co., of Dallas, Tex., for $40,000.

New Orleans, La.—The contract for furnishing a 4,000,000-gal. pump for the Algiers water-works system was awarded to the Epping-Carpenter Co., Jan. 9, for $5950.

Buffalo, N. Y.—Special. The contract for the excavation for a trench for a 36-in. water pipe in Leroy ave., was awarded, Jan. 13, to Dark & Co., at $2.55 a cu. yd.

Cambridge Springs, Pa.—The contract for erecting a filtration plant was awarded to the Pittsburg Filter Co., for $6885 with an additional cost of $245 in case a direct connected blower is specified.

Perth Amboy, N. J.—The contract

for the purchase of the old abandoned 16-in. water main under the Raritan river was awarded to Dunean J. Currie, at $5 a length and 2½ cts. a pound for the lead from the joints.

Washington, D. C.—The contract for furnishing a wheel pump for use in connection with the Yuma irrigation project, Arizona-California, was awarded to the Featherstone Foundry & Machine Co., 348 N. Halstead st., Chicago, for $2643.

Worcester, Mass.—The contract for furnishing materials was awarded, Jan. 14, to the Central Supply Co., 35 Waldo st., as follows: 10,000-ft. 1¼-in. and 20,000-ft. 1-in. wrought steel pipe, $5.95 and $4.25 per 100-ft., respectively.

Rock Island, Ill.—The contract for remodeling and enlarging the filter plant of the Davenport Water Co., was awarded Jan. 13 to the New York Continental Jewell Filtration Co., 15 Broad st., New York City, for about $30,000.

Tucson, Ariz.—The contract for installing a pipe line was awarded to the American Light & Water Co. for $245,940, and for supplying a Corliss pump, 2 boilers, a heater and 2 boiler feed pumps to E. J. Merkle, for $23,000.

Wilmington, Del.—The United States Cast Iron Pipe & Foundry Co., of New York City, was awarded the contract, Jan. 13, for supplying 50000-ft. of 8-in. and 2000-ft. of 12-in. pipe, at $25 per ton each, and 2¾ cts. a pound for special castings.

Norfolk, Va.—The contract for furnishing nearly 4000 meters was awarded to M. J. Drummond & Co., of this city, for $50,000. The company's bid was as follows: ⅝-in. trident disc meters, with ¾-in. connections, $8.40 each, ¾-in. size, $12.60 each.

Columbia, S. C.—Contracts for furnishing water mains and specials were awarded recently as follows: Piping and specials, Glamorgan Pipe & Foundry Co., of Lynchburg, Va., 6-in. pipes, $27.45 per ton 2000 pounds; 8-in. pipes, $27.05; 12-in., $27; specials, $57 per ton. Valves—Fairbanks Co., of Baltimore, 6-in. valves, $12.55; 8-in., $18.65; 12-in., $37.65.

Claremore, Ok.—Contracts have been awarded as follows: Dimmick Pipe Co., Birmingham, Ala., for c. i. pipe, $30.15 per ton; to Wesco Supply Co., of St. Louis, Mo., for 60-h. p. 3-phase, 2,300-volt motor; to Dean Steam Pump Co., Indianapolis, Ind., for 500 R. P. M. triplex pump.

Anderson, Ind.—Bids were submitted Jan. 9 for installing a 5,000,000-gal. reservoir at the water-works plant, as follows: Canton-Hughes Pump Co., Canton, Ohio, (four bids) $18,900, $16,990, $16,490, $12,990; William Todd, Youngstown, Ohio, (four bids) $14,650, $17,150, $14,625, $13,825; Nordberg Mfg. Co., Milwaukee, Wis., (four bids) $17,700, $16,900, $14,625, $13,825; Allis-Chalmers Co., Milwaukee, Wis., $16,570; Bethlehem Steel Co., Bethlehem, Pa., (two bids) $12,650, $12,100; Snow Steam Pump Co., 114 Liberty st., New York City (three bids) $18,785, $18,230, $18,450; Henry R. Worthington, 114 Liberty st., New York City, $11,240; Laidlaw-Dunn-Gordon Co., 114 Liberty st., New York City (four bids) $11,735, $13,690, $14,015, $11,385; Epping-Carpenter Co., Pittsburg, Pa., (four bids) $12,000, $16,490, $11,200, $16,365; Fairbanks-Morse Co., Indianapolis, Ind., (two bids) $13,258, $11,931.

BRIDGES.

Colfax, Wash.—Bids are asked until 2 p. m. Feb. 5 for constructing 9 new bridges. Co. comrs.

Elmwood, Mass.—The park commissioners have had plans prepared for building a bridge over Pine st.

Cleveland, O.—Sealed bids are asked until Feb. 12 for constructing concrete steel bridges. Julius C. Born, clk.

Neligh, Neb.—Bids are asked until March 3 for constructing steel bridges. W. H. Morgan, chmn. com. on rd. & bridges.

Beeville, Tex.—Bids are asked until Feb. 11 for constructing an iron bridge over Paista creek. W. W. Dodd, co. judge.

Grand Forks, N. D.—Bids are asked until Feb. 11 for constructing any or all bridges during 1908. Hans Anderson, co. audt.

Huntsville, Mo.—Bids are asked until Feb. 14 for constructing the sub and superstructure of a low truss bridge. Forrest Morgan, co. engr.

Gretna, La.—Bids are asked until Feb. 5 for repairing Metaire bridge over Upper Protection Canal. M. A. Danenhauer, secy. Police Jury.

Hays, Kas.—Bids are asked until Feb. 8 for constructing 7 low pile bridges and for repairs to the Dalton bridge. Mark Hadley, clk. Saline twp.

Carterton, Va.—Bids are asked until Feb. 8 for constructing an iron bridge across Clinch river here. Silas B. F. Counts, sect. bd. comrs.

Alexandria, La.—Bids are asked until Feb. 20 for constructing a steel span with pile trestle approach, over Bayou Rapids. Fred Seip, chmn. bridge com.

Chico, Cal.—Plans and specifications have been prepared for constructing a concrete bridge over Litle Chico Creek on the Dayton road. M. C. Polk, cy. engr.

Carthage, Mo.—Special. John W. Layne, of the Lamar & Barton County Telephone Co., desires to communicate with some practical cement bridge construction man.

Indianapolis, Ind.—Blaine H. Miller, cy. engr., has about completed specifications for the repair of the Virginia ave. viaduct, preparatory to repairing it.

Atlanta, Ga.—Sealed bids are asked until Feb. 5 for constructing a ferro-concrete bridge across Peachtree creek on Peachtree road. Clifford L. Anderson, chmn. bd. comrs.

Gulfport, Miss.—Bids are asked until March 2 for constructing a drawbridge near Morris' Ferry on new road across Tchoutachabouffa river. F. S. Hewes, clk. bd. co. supvrs.

Troy, O.—Sealed bids are asked until Feb. 4 for constructing the superstructure of a hand lift bridge over the Miami and Erie canal at High st., in Piqua. E. E. Pearson, co. audt.

Fall River, Mass.—The extension of Warren st. from Jefferson st. easterly across the Quequechan river to meet E. Warren st. is proposed, which would necessitate the construction of a bridge about 1000-ft. in length.

New York City.—Bids are asked until Feb. 6 for constructing additional

girder supports for the main towers of the Williamsburg bridge over East river between Manhattan and Brooklyn borough. Jas. W. Stevenson, comr. bridges.

Buffalo, N. Y.—Special. The Buffalo Creek R. R. Co. made application, Jan. 20, to the common council for permission to re-locate its bridge over its extension of the City ship canal, and to construct and maintain a bascule bridge across the same for public use.

Brandon, Man.—Special. W. H. Shillinglaw, cy. engr., says the city council has passed a final recommendation to construct a reinforced concrete bridge across the Assiniboine river here, at an estimated cost of $60,000. The bridge will consist of three 90-ft. spans with approaches.

STREET LIGHTING.

Edgeley, N. D.—Plans are being prepared for an electric light plant.

Port Huron, Mich.—Mayor John Bell advocates a municipal gas plant for this city.

Ocean Park, Cal.—Plans for a gas and electric light plant have been submitted to the town trustees.

Lecompte, La.—Bids will be asked about March 1 for constructing an electric light plant. W. H. Jones, cy. clk.

Lakeport, Cal.—Bids are asked until Feb. 15 for improvements to the plant of the County Electric Power Co.

Tabor, Ia.—The formation of a stock company for the purpose of installing an electric light plant here is proposed.

Lafayette, Ga.—Bids will probably be asked until May 1 for constructing an electric light plant. J. A. Clement, cy. recdr.

New London, Wis.—The electric light & w. w. comn. is discussing the question of purchasing new equipment for the electric light plant.

Rockport, Ind.—The installation of a 60 to 100-h. p. gas engine and gas producer is contemplated. A. H. Kennedy, mgr., Rockport W. W. Co.

Newark, N. J.—John F. Otterbein, co. supvr., recommends, in his annual report, an electric light plant at the courthouse owned and operated by the county.

New Albany, Ind.—City conucil has ordered a franchise prepared to be sold to the highest bidder to light the streets of this city. L. T. Mann, cy. engr.

Monson, Me.—A contract for installing an electric light plant for the Monson Light & Power Co., has been awarded to Ernest D. Blaisdell, of Dexter, Me.

Milwaukee, Wis.—Sealed bids are asked until Feb. 13 for furnishing and erecting a gas producer plant for a municipal electric light plant. Chas. J. Poetsch, chmn. B. P. W.

Kansas City, Mo.—A committee representing retail merchants in the Business Men's League is to formulate a plan for an uniform system of downtown street lighting.

Augusta, Ga.—Bids are asked until Feb. 25 for furnishing and delivering an electric switchboard, motor generator sets, motors, compressor, etc. Commanding officer, Augusta Arsenal.

Monroe, Wis.—The special committee appointed some time ago has recommended that the city own its street lighting plant unless suitable terms can be reached in making a new contract with the electric light company.

Indianapolis, Ind.—Sealed bids are asked until Feb. 4 for installing a generator direct connected to a steam unit (engine or turbine) foundations, steam connections, switch board pannel, with main switch, etc. Bd. trustees General Indiana Hospital for Insane.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Bellaire, O.—The question of constructing a garbage crematory is being discussed.

Waycross, Ga.—In his annual report A. M. Knight, mayor, recommends the construction of a garbage crematory.

New Haven, Conn.—The contract for the removal of garbage in the Western district was awarded, Jan. 14, to Natile Acunto, for $5150, and in the Eastern district to Robert D. Daly, for $5000.

St. Louis, Mo.—Bids are asked until Feb. 11 for furnishing tools, labor, machinery, buildings, etc., for the reduction of garbage for a term of years ending Sept. 1, 1918. W. B. Dryden, secy. B. P. I.

Oakland, Cal.—The garbage crematory committee of city council has, according to local press reports, decided to recommend to the bd. of pub. wks. that a committee be sent to eastern cities to study the disposal of garbage, and to recommend a plan for adoption by this city.

Baltimore, Md.—The Southern Products Co., Fidelity Bldg., was awarded the contract for the disposal of the city's garbage from 1908 for $587,500. The company also agrees to purchase the city disposal plant for $100,000 and remove it a greater distance from the city.

PARKS.

Washington, D. C.—A bill has been introduced to establish a public park on block 4213 in this city.

Cincinnati, O.—An ordinance has been passed providing for the issue of $20,000 bonds for the purpose of improving land acquired for park purposes.

FIRE APPARATUS.

Saginaw, Mich.—Underground wiring is being considered for the fire alarm system.

St. Paul, Minn.—Bids are asked until Feb. 4 for furnishing 2 piston steam fire engines, 2nd size. Bids will be received at the same time for a steam fire engine boiler for a 1st size Nott engine.

Buffalo, N. Y.—Special. The fire commisioners have recommended to common council that the contract for building a steel hull steamboat to be used as a patrol boat in the police department be awarded to B. L. Cowles for $18,500.